



THE NIGERIAN ACADEMY OF SCIENCE

3rd NAS SCIENTIFIC CONFERENCE

Theme:
**Science and
Technology Innovations
for National Growth
and Development**

25th & 26th January, 2022

Nigerian Air Force Conference Centre
& Suites, Abuja

— BOOK OF ABSTRACTS —

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The Nigerian Academy of Science

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About the Nigerian Academy of Science

The Nigerian Academy of Science (NAS), established in 1977 (but incorporated in 1986), is the foremost independent scientific body in Nigeria. NAS is uniquely positioned to bring scientific knowledge to bear on the policies/strategic direction of the country and is also dedicated to the development and advancement of science, technology, and innovation (STI) in Nigeria. The aims and objectives of the Academy are to promote the growth, acquisition, and dissemination of scientific knowledge, and to facilitate its use in solving problems of national interest. Over the years, the Academy has done this by:

- Providing advice on specific problems of scientific or technological nature presented to it by the government and its agencies, as well as private organizations
- Bringing to the attention of the government and its agencies problems of national interest that science and technology can help solve
- Establishing and maintaining the highest standards of scientific endeavours and achievements in Nigeria, through the publication of journals, organization of conferences, seminars, workshops, and symposia, recognition of outstanding contributions to science in Nigeria, and the development of a working relationship with other national and international scientific bodies and academies.

As with national academies in other countries, NAS is a not-for-profit organization with total membership (since inception) of 268 Fellows elected through a highly competitive process, who have distinguished themselves in their fields both locally and internationally. Some of her members have served as vice-chancellors of universities, director-generals of government parastatals, and ministers in federal ministries. The Academy, given its clout, also has the ability to attract other experts from around the country and internationally when needed. NAS is Nigeria's national representative on such bodies as the International Science Council (ISC) – the umbrella body for all science associations and unions, and the InterAcademy Partnership (IAP) – the umbrella body for all national science academies globally. The Academy is also a founding member of the Network of African Science Academies (NASAC).

About the 2022 Conference

The 2022 NAS Scientific Conference is the third in the series. The theme for the 2022 edition - *Science and Technology Innovations for National Growth and Development* - has been selected to showcase new technologies that can propel national development. This year's conference would feature presentations under the following subthemes:

1. The Internet Revolution and Nigeria: Innovation Start-ups as Engine for Youth Creativity and Economic Revolution
2. Strategies for Sustainable Energy Transition in Nigeria
3. Drug and Vaccine Development, Phytomedicine, and Phytotherapy
4. Climate Change, Environmental Conservation, and Pollution Control
5. Food Security, Safety, and Sustainability
6. Science and Innovation in National Security Management
7. Uncovering the Talents in Innovation in Nigerian Universities

The overall aim of the Conference is to create a platform for effective networking and collaboration amongst research groups, industry, government and technology hubs. The objectives of the Conference are to:

- Showcase original scientific research and innovations
- Disseminate scientific information concerning issues of national relevance
- Create a platform to discuss scientific issues of societal significance
- Foster mentorship, networking, and collaboration among Nigerian scientists.

The NAS, through its initiatives and international links, is uniquely positioned to ensure that scientific research and innovations create the right impact on national growth and development. With the right strategies and support, the unique knowledge base and skills in Nigeria's institutions, access to funding, and leveraging of global interfaces can help to unleash the latent capabilities, and drive even greater dimensions in knowledge development and innovation.

Conference Organizing Committee

- Professor Abubakar Sambo FAS – Vice President, NAS/Chair, Conference Committee
- Professor Oluwole Familoni FAS – Academic Secretary (Physical Sciences), NAS
- Professor Sunday Atawodi FAS – Academic Secretary (Biological Sciences), NAS
- Professor Musbau Akanji FAS – Public Affairs Secretary, NAS
- Dr. Kehinde Ladipo FAS – Representative, Physical Sciences/Chair, NAS Fundraising Committee
- Professor Uche Amazigo FAS – Representative, Biological Sciences, NAS

The Committee acknowledges the contributions of the following NAS fellows towards the review of submitted abstracts for the Conference:

- Professor Micah Osilike FAS
- Professor Abubakar Sambo FAS
- Professor Barth Nnaji FAS
- Professor Joseph Okogun FAS
- Professor Sunny Ohia FAS
- Professor John Agbenin FAS
- Professor Matthew Ilori FAS
- Professor Henrietta Ene-Obong FAS
- Professor Lateef Sanni FAS
- Professor Nicholas Damachi FAS
- Professor Soga Sofola FAS

NAS Secretariat staff

- Dr. Oladoyin Odubanjo – Executive Secretary
- Mr. Samuel Shofuyi – Finance & Administrative Manager
- Miss Gertrude Ogieguata – Senior Program Officer (Development)
- Miss Angie Olanipekun – Senior Program Officer
- Miss Blessing Onyema – Program Officer
- Miss Mobolaji Dasaolu - Administrative Officer (Communications)
- Mrs. Ifeoluwa Edawole - Administrative Officer (Finance

Conference Agenda

Time	Activity
DAY ONE: TUESDAY 25TH JANUARY, 2022	
8:30am	Arrival
Opening Session <i>Session Chair: Professor Ekanem Braide FAS – President, the Nigerian Academy of Science (NAS)</i>	
9:00am	Welcome/Introduction of Special Guests <i>Dr. M. Oladoyin Odubanjo – Executive Secretary, NAS</i>
9:05am	Opening Remarks <i>Professor Ekanem Braide FAS</i>
9:15am	Goodwill Messages <ul style="list-style-type: none"> • Prof. Suleiman Bogoro FAS - Executive Secretary, Tertiary Education Trust Fund (TETFund) • Dr. Ifedayo Adetifa – Director-General, Nigeria Centre for Disease Control (NCDC) • Dr. Obi Adigwe - Director General, National Institute for Pharmaceutical Research and Development (NIPRD) • TY Danjuma Foundation • NGSA • Dr. Ogbonnaya Onu FAS – Honourable Minister, Federal Ministry of Science and Technology • Dr. Osagie Ehanire - Honourable Minister, Federal Ministry of Health
9:30am	Keynote Address 1: Science and Technology Innovations for National Growth and Development <i>Engr. Prof. M. S Haruna – Executive Vice Chairman, National Agency for Science and Engineering Infrastructure (NASENI)</i>
Sub-theme 1: Strategies for Sustainable Energy Transition in Nigeria <i>Session Chair: Professor Abubakar Sambo FAS – Vice President, NAS/Chair, Nigerian Member Committee of the World Energy Council (WEC)</i>	
10:00am	Lead Presentation: Strategies for Sustainable Energy Transition in Nigeria <i>Professor Chidi Akujor FAS - Professor of Physics, Federal University of Technology, Owerri</i>
10:20am	Oral Presentation 1: Performance and Emission Characteristics of Baobab (<i>Adansonia digitata</i>) Biolubricant in Four Stroke Spark Ignition Engine <i>Hafizu Ibrahim - Department of Mechanical Engineering, Ahmadu Bello University, Zaria</i>
10:35am	Oral Presentation 2: The Role of Oil and Gas Companies in the Energy Transition During the PIB ACT 2021 Era <i>Ismail Zarma - Energy Commission of Nigeria, Abuja</i>
10:50am	Oral Presentation 3: Hybrid Pre-treatment Modelling and Optimization for Enhanced Sugar Recovery from Fresh Waste Potato Peels <i>Adeniyi Adebule - School of Live Sciences, Department of Microbiology, University of KwaZulu-Natal, Pietermaritzburg, South Africa</i>
11:05am	Discussion
11:30am	Tea Break/Poster Session/Exhibitions

Sub-theme 2: The Internet Revolution and Nigeria - Innovation Start-ups as Engine for Youth Creativity and Economic Revolution <i>Session Chair: Dr. Kehinde Ladipo FAS - Representative, Physical Sciences, NAS</i>	
12:00pm	Lead Presentation: The Internet Revolution and Nigeria - Innovation Start-ups as Engine for Youth Creativity and Economic Revolution <i>Mrs. Solape Hammond - Special Adviser, Lagos State Office of the SDGs and Investments</i>
12:20pm	Oral Presentation 1: Integration of Artificial Intelligence in the Radiology Department: Knowledge, Attitude and Perception of Radiographers and Student Radiographers in Enugu, Nigeria <i>Angel-Mary Anakwue – Department of Medical Radiography and Radiological Sciences, University of Nigeria</i>
12:35pm	Oral Presentation 2: A Taxonomy of Simulation Tools in Vehicular Adhoc Networks (VANETS) <i>Amos Gana Jiya - Department of Telecommunication Engineering, Federal University of Technology, Minna</i>
12:50pm	Oral Presentation 3: Need for ICT Innovative Teaching and Instructional Strategy with Animation <i>Tope Olatunde-Aiyedun - Department of Science and Environmental Education, University of Abuja</i>
1:05pm	Discussion
Sub-theme 3: Drug and Vaccine Development, Phytomedicine, and Phytotherapy <i>Session Chair: Professor Florence Nduka – Chair, Niger Delta Development Commission (NDDC) Board on Malaria and Phytomedicine</i>	
1:30pm	Lead Presentation: Genomics and Targeted Drug Development <i>Dr. Abasi Ene-Obong - CEO, 54Gene</i>
1:50pm	Oral Presentation 1: Glucagon-like Peptide 1 Receptor (GLP1R) Agonism Underlie <i>Sphenocentrum jollyanum</i>-mediated Hypoglycemia and Reversed Pancreatic Damage in Streptozotocin-treated Adult Wistar Rats <i>Olaposi Omotuyi - Institute for Drug Research and Development, S. E. Bogoro Center, Afe Babalola University, Ado-Ekiti</i>
2:05pm	Oral Presentation 2: Isolation, characterization and optimization of carotenoid producing yeasts from Pietermaritzburg, KwaZulu-Natal, South Africa <i>Ayodeji Adedoyin - University of KwaZulu-Natal, Pietermaritzburg, South Africa</i>
2:20pm	Oral Presentation 3: Safety Assessment of the Crude Methanol Extracts of Fruits of <i>Sarcocephalus latifolius</i> (SMITH) BRUCE using <i>Drosophila melanogaster</i> as a Model <i>Joan Imah-Harry - Department of Biochemistry, Faculty of Pure and Applied Sciences, Precious Cornerstone University, Ibadan, Nigeria</i>
2:35pm	Discussion
LUNCH BREAK	
Sub-theme 4: Climate Change, Environmental Conservation, and Pollution Control <i>Session Chair: Professor Oluwole Familoni FAS – Deputy Vice-Chancellor (Academics and Research), University of Lagos</i>	
4:00pm	Lead Presentation: Climate Change, Environmental Conservation, and Pollution Control <i>Professor Babajide Alo FAS - Centre Director, University of Lagos Centre for Environmental Human Resources Development (CENHURD)</i>
4:20pm	Oral Presentation 1: Kinetics and Thermodynamic Studies on the Removal of Estrone and β-Estradiol (endocrine disruptors) from Aqueous Solution by Eco-friendly Biomaterials from Agricultural Waste as a Potential Adsorbent <i>Peter Ejuidike - Department of Chemical Sciences, Faculty of Science and Science Education, Anchor University, Lagos, Nigeria</i>

4:35pm	Oral Presentation 2: Micropropagation Protocol Development for <i>Acacia senegal</i> (Gum Arabic) in Borno State of Nigeria <i>Njidda Gadzama - Biotechnology Centre, University of Maiduguri, Borno State, Nigeria</i>
4:50pm	Oral Presentation 3: Radiological Hazard Assessment of Natural Radionuclides in Soil Samples from Farmlands of Oil Producing Area Of Ohaji-Egbema in Imo State, Nigeria <i>Udoka Ukwuihe - Department of Physics, Federal University of Technology, Owerri</i>
5:05pm	Discussion
5:30pm	Closing Remarks / End of Day One <i>Professor Oluwole Familoni FAS</i>
5:40pm	Tea Break/Poster Session/Networking
DAY TWO: WEDNESDAY 26TH JANUARY, 2022	
8:30am	Arrival
Opening Session <i>Session Chair: Professor K. Mosto Onuoba FAS – Immediate Past President, NAS</i>	
9:00am	Welcome remarks <i>Professor K. Mosto Onuoba FAS - Immediate Past President, NAS</i>
9:05am	Keynote Address 2: The Internet of Things - Formulating the Strategies for Infrastructure Growth in Nigeria <i>Mr. Godwin Benson – Founder/CEO, Tuteria</i>
Sub-theme 5: Food Security, Safety, and Sustainability <i>Session Chair: Professor Lawal Bilbis – Vice Chancellor, Usmanu Danfodiyo University, Sokoto</i>	
9:35am	Lead Presentation: Food Security, Safety, and Sustainability <i>Professor Tola Atinmo FAS - Department of Human Nutrition, University of Ibadan</i>
9:55am	Oral Presentation 1: Genetic Variations in Advanced Cowpea (<i>Vigna unguiculata</i> (L) Walp) Breeding Lines Exposed to Alpha SpinR Nanoplates <i>Hauwa Ahmed Kana - Federal University of Lafia</i>
10:10am	Oral Presentation 2: In-silico Studies of Compounds from <i>S.kumba</i> and <i>S.aethiopicum</i> Eggplant Fruits on Enzymes linked to T2DM and its Inclusive-diet Effect in Diabetic-like C2C12 Cell Lines <i>Esther Nwanna - Department of Biochemistry, Federal University of Technology, Akure, Nigeria</i>
10:25am	Oral Presentation 3: Analysis of Expenditure Pattern and Household Food Security Status of MicroVeg Project Beneficiaries in Southwestern, Nigeria <i>Kaotbar Idris-Adeniyi - Department of Agricultural Extension and Rural Development Osun State University, Nigeria</i>
10:40am	Discussion
11:05am	Tea Break/Poster Session and Adverts/Exhibitions
Sub-theme 6: Science and Innovation in National Security Management <i>Session Chair: Professor Musbau Akanji FAS – Public Affairs Secretary, NAS</i>	
11:40am	Lead Presentation: Science and Innovation in National Security Management <i>Air Vice Marshall Onyemaechi Osabor (Rtd.) – Former Director-General, Defence Research and Development Bureau (DRDB)</i>
12:00pm	Oral Presentation 1: A Philosophical Appraisal of Artificial Intelligence and National Security: Towards Addressing Nigeria’s Security Challenges

	<i>Francis Ogonyi - Department of Philosophy, University of Calabar, Nigeria</i>
12:15pm	Oral Presentation 2: Role of Science, Innovation and Entrepreneurship in National Development <i>Francisca Okeke FAS - University of Nigeria, Nsukka</i>
12:30pm	Oral Presentation 3: Physics Education: A Necessary Tool for National Security and Development in Nigeria <i>Ezechinyere Uwakwe - Department of Physics, Alvan Ikoku Federal College of Education, Owerri, Imo State</i>
12:45pm	Discussion
Sub-theme 7: Uncovering the Talents in Innovation in Nigerian Universities <i>Session Chair: Professor Sunday Atavodi FAS – Academic Secretary, Biological Sciences, NAS</i>	
1:10pm	Lead Presentation: Uncovering the Talents in Innovation in Nigerian Universities <i>Professor Abiodun Musa Aibinu - Professor of Mechatronics, Federal University of Technology, Minna</i>
1:30pm	Oral Presentation 1: De-globafriicalisation for Sustainable Research Impact: Research and Researchers’ Assessments, Journal Impact Factor and other Metrifications <i>Atolani Olubunmi - Department of Chemistry, University of Ilorin, Nigeria</i>
1:45pm	Oral Presentation 2: Disruptive Innovation Meeting the Demands of the Fifth Industrial Revolution (Wave) at Nigerian Universities <i>Christiaan Jacobs - University of Africa, Bayelsa State, Nigeria</i>
2:00pm	Oral Presentation 3: Preparation and Characterization of Silver Nanoparticle-doped Strontium Aluminate for the Development of Traffic Paint <i>Oluwakemi Oladeji - Department of Chemistry, Federal University of Technology, Minna, Niger State, Nigeria</i>
2:15pm	Discussion
2:40pm	Vote of thanks <i>Professor Abubakar Sambo FAS – Vice President, NAS/Chair, Conference Committee</i>
2:45pm	Closing remarks <i>Professor Ekanem Braide FAS – President, NAS</i>
2:50pm	Lunch
3:50pm	NAS Gold Medal of Science Award Ceremony

Abstracts

Keynote Speakers

Science and Technology Innovations for National Growth and Development

M. S. Haruna - Executive Vice Chairman/Chief Executive, National Agency for Science and Engineering Infrastructure (NASENI)

Developments in cutting edge technologies better known as frontier technologies have shown tendencies to widen the socio-economic gaps between the advanced and developing nations on one hand; and between the third world and developing countries on the other. These technologies include Artificial Intelligence (AI); Robotics; the Internet of Things (IOT); Big Data; Block Chain; Additive Manufacturing (3D Printing); Autonomous Vehicles; Unmanned Aerial Vehicles (UAV); Gene Editing; 5G Network and the recent innovation of high-efficient solar cell that can produce a thousand times more power than the silicon based solar cells. Despite the opportunities and high potentials for sustainable development brought about by these elements of Fourth Industrial Revolution (Industry 4.0), they risk increasing inequalities by escalating and creating new digital divides between the technology haves and the have-nots. The COVID-19 pandemic has exposed the weaknesses of the third world nations and motivated some developing and developed countries to take full advantage of global meltdown and transit much faster and earlier into the next industrial revolution thus expanding the Science, Technology, and Innovation (STI) dichotomy. Nigeria is yet to be prepared to catch this technological wave to imitate, copy, use, adopt and adapt to the ongoing industrial revolution. This is a country so blessed with abundant natural resources; large population; talents; large geographical and suitable location as well as most friendly climate but still imports food, other consumables, and by-products of crude oil. As one of those saddled with the responsibilities of implementing strategic STI policies appropriate to our country's predicament, I am pained that foreign technologies and equipment in our mobile telecommunication; online banking services; Integrated Personnel Payroll Information System (IPPIIS); Government Integrated Financial Management Information System (GIFMIS); Remita payment platform; 2G to 4G and now 5G broadband deployment dominates our economy. The implication is that current and subsequent generation of Nigerians will remain consumers of imported products. The lack of domestic endogenous capability and capacity to produce modern technologies and competitive industrial goods and services in Nigeria's economy is fuelling frightening poverty, joblessness, and insecurity in Nigeria. Wealth creation, peace, progress, and stability are bye-products of knowledge-based economy, and not commodity or raw material oriented and import dependent economy. This paper illustrates evidently that only home-grown solution rooted in massive soft and hard STI infrastructure can rescue the country from its economic vicissitude. It portrays that only building domestic endogenous capacity for science and technology development in Nigeria, in particular, the capacity for research and development; engineering design and fabrication; technology production; technology innovation and industrial production can solve security challenges, alleviate poverty and all other socio-economic

predicaments. It concludes with recommendation on how to establish and sustain competitive industrial economy that can produce and manufacture modern technologies and globally competitive industrial goods in Nigeria using enabling home grown STI.

Lead Presentations

Environmental Conservation, and Pollution Control in Nigeria – Retrospective Analysis and Proactive Solutions

Babajide Alo, FAS, FNES - Centre Director, University of Lagos Centre for Environmental Human Resources Development (CENHURD)/Foreign Secretary, Nigerian Academy of Science

Development, albeit sustainable development, will be meaningful if it does not increase a country's vulnerability to environmental impacts. If a nation's environmental foundations are depleted, its economy may as well decline, its social fabric may deteriorate, and its political structure may even become destabilized (Nigeria's National Policy on Environment, 2016).

Nigeria is confronted by major environmental problems, the most important of which are: deforestation, drought and desertification, soil and coastal erosion (oceanification), water pollution, oil pollution, poor municipal waste management, loss of biodiversity, flooding, urban decay, and industrial pollution. These have resultant effects on national productivity, economy and security.

Similarly, Nigerian cities are witnessing high rate of environmental deterioration and are rated among urban areas with the lowest livability index in the world. Between 20 percent and 30 percent of the urban population only enjoy decent urban life in the country mostly due to serious urban pollution from poor housing, poor domestic/municipal waste management, air pollution, poor transportation modes etc. To worsen this situation, like it is in many developing nations, one of the main challenges to sustainable economic development and healthy living is the poor access to, and abject lack of sustainable energy options.

Overall, the interaction of these millions of Nigerians with their respective environment has left indelible mark on the landscape. The unwise use of the natural environment due to ignorance, poverty, overpopulation and greed amongst others has led to the degradation of the environment (Alo, 2020).

The constraints to the effective implementation of the many policies and legal instruments for management of the environment are: a) uncoordinated policy and legal instruments in environmental and natural resources conservation in Nigeria; b) the existence of a large number of disparate legislation and policy documents directed at individual environmental or resources issues or problems; c) weak databases and inadequate/inaccurate data adversely affecting policy formulation, project planning, and implementation of environment and natural resources conservation; d) the inadequate and unsystematic inventory of Nigeria's natural resources and the

dearth of detailed technical data that could be used to plan the management and National utilization of resources; e) the poor enforcement of existing environmental rules and regulations and the inadequacy of monitoring and enforcement mechanisms; and f) inadequate institutional capacity, and inter-sectoral communication and co-ordination to manage the environmental and resource management network throughout the country.

In addition to policy issues, central to achieving the SDGs targets and goals towards environmental protection and sustainable development, is the promotion of research and innovation in science and technology especially successful chemicals, waste and pollution actions. There must be concerted scientific efforts at developing: smart cities and vertical growth for land conservation; provision of solutions to energy crisis with renewable, alternative energy sources; development of cleaner production methods; water treatment technologies; wealth creation from waste management systems to address pollution problems; evaluation of carbon footprints for all human activities; nature mimicry among others.

Food Security, Nutrition, Safety and Sustainability

Tola Atinmo FAS - Department of Human Nutrition, University of Ibadan

One of the standard indicators of development of any nation is the state of food security, which is better assessed currently with the use of nutrition security indicators. The current statistics of under-five nutrition in many developing nations including Nigeria is worrisome. This is a strong signal of impending serious food crisis, which usually comes with attendant anti-social vices and poor national development as a reflection of poor quality population. This situation has been accentuated in Nigeria in recent years with the state of national insecurity, which has left the food production sector in a very deplorable condition. Many theories have been propounded on the challenges that are associated with food and nutrition insecurity, but workable solutions have not been well discussed with palpable results. The use of ecological model can provide feasible approaches to curb the effects of this phenomenon in Nigeria if properly harnessed. The potentials in the various stages of ecological model can provide relevant information, which can also positively influence food and nutrition insecurity issues if the template is given serious consideration. The ecological model has been used successfully in resolving public health issues in many developing countries and its adoption to promote food and nutrition security, safety and sustainability may be near perfect.

Drug Development, Phytomedicine, and Phytotherapy

Abasi Ene-Obong, CEO, 54gene

Over the decades, drug discovery has moved from phenotypic observations to precision medicines developed against drug targets validated through genomics research.

With that evolution, it has been shown that drugs that are supported by human genetic data are about twice as successful in the clinic. Additionally, the genetic validation provides insights on how to more appropriately modulate the target to increase the efficacy of the drug.

Precision medicine drug discovery aims to develop the most appropriate modulation applied to the target that is most relevant to the patient population. This modulation can be accomplished through, amongst others, gene therapy, antibody treatment, or plant-based and synthetic small molecule drugs.

Genomics-informed drug discovery benefits from increased genomics diversity: the more diversity in the genomes, the higher the chance to identify a variant that associates with a trait or disease of interest. Most genomics research performed to date has been done on non-African genomes, even though African populations have the most diverse genetic makeup of all populations. Only 3% of the worldwide genomics data is derived from African and other diverse populations. Harnessing this rich dataset would deepen our understanding of diseases, many of which are very complex in nature.

One of the major challenges in developing precision medicines for African populations is that historically, drug development has been focused on Western populations using tools and approaches that work excellent for the intended patients but are sometimes inadequate for addressing the needs of other populations.

54gene is working on addressing some of these challenges, starting with the collection of genomics data. The initial focus is on Nigeria, with subsequent initiatives starting across the continent. Genomics in drug discovery in Nigeria is a very new field of endeavor. When harnessed effectively this would significantly catalyze the country's continued commitment to self-sustainability in drug development for local health needs. With genomics-driven drug discovery, Nigeria and other African countries would be able to develop medicines addressing specific health needs of Africans. In addition, leveraging the increased diversity inherent to African populations, will facilitate target discovery which has implications for global health.

Genomics-driven drug discovery efforts at 54gene are initially focused on putting Nigeria on the global drug development map and we are expanding our efforts to other African countries. Our work is being catalyzed through a database of diverse African genomic data coupled with rich phenotypic data. This helps us to identify novel disease loci which could be targeted, to improve patient health. Our investment in genomics, data science and drug discovery teams led by world renowned experts and a strong genomics laboratory are key to driving our drug discovery efforts. The development of a custom genetic analysis chip (SNP array) by our data science team is an important resource that stands to improve the precision of genetic target discovery among Africans and also facilitates genomics studies at a lower cost.

While 54gene operations are heavily focused on Nigeria, the insights obtained from this research can be extrapolated to the rest of Africa and out of Africa to the rest of the world. For example,

the discovery of protective loss-of-function mutations in African Americans led to the development of a therapeutic for high cholesterol (a treatment not specific to African Americans).

As a pan-African institution, our goal is to take the journey to a successful genomic drug development infrastructure together with other ecosystem players and not alone. We believe that open and purposeful collaborations between government, academia and industry partners is the way for sustainable growth and impact creation in Africa.

Strategies for Sustainable Energy Transition in Nigeria

Chidi Akujor FAS - Federal University of Technology, Owerri

We discuss the current state of energy supply in Nigeria. The path to, and options for a transition from fossil fuels to a low carbon energy milieu for Nigeria are presented. We also discuss the problems inherent in such transition, and make suggestions for a sustainable national energy mix.

The Internet Revolution and Nigeria - Innovation Start-ups as Engine for Youth Creativity and Economic Revolution

Solape Hammond - Special Adviser, Lagos State Office of the SDGs and Investments

This paper describes the immense impact of science, technology, and innovation in advancing youth's contribution towards achieving socio-economic growth and development in Nigeria.

By putting in perspective the digital revolution, the paper identifies significant phases that spring up the adoption of science and technology as a conduit for economic innovation and human development.

The paper explains the benefit of connecting digital opportunities to Nigeria's demographic dividend to scale-up economic revolution. To cast a spotlight on the place of youth in innovation and the Nigeria economy, the paper lays emphases on and elicits ideas on how innovation in technology can harness the potential of youth towards advancing the country's development agenda and to stem steadily rising youth unemployment rates.

Discussions on 'Top Nigeria start-ups that raised above \$100 in 2021' shed light on how the innovative potential of young people, combined with the power of technology, is already proving to be a powerful force on the road to achieving the Sustainable Development Goals in the country.

Through the 'Lagos Example', the paper discusses the role of the Lagos State Government in seizing digital opportunities to support youth employment and entrepreneurship.

In proposing strategies for government to prioritize and purposefully adopt new technologies to promote positive youth development and leverage on their potentials to appreciate the dividend of

science and technology, it highlights the imperative of developing and fostering an enabling environment for future innovation and ultimately economic growth.

Uncovering the Talents in Innovation in Nigerian Universities

Abiodun Musa Aibinu - Professor of Mechatronics, Federal University of Technology, Minna

The developed countries make adequate use of research and development activities to advance their fortunes economically, politically, and socially. Thus, the ability of a country to consistently produce valuable and innovative research outputs is critical to its development.

In 2021, Nigeria was ranked 124 in the global innovation rankings, according to the global innovation index, despite the fact that the country has over 300 tertiary institutions. Furthermore, the country has several agencies saddled with the responsibility of promoting innovation and creativity, particularly among the youth; however, the output from those agencies has not resulted in a significant increase in the country's technological ranking.

These challenges are the result of a variety of factors, including a large gap between academia and industry, as well as lack of a sustainable method for transforming research outputs into commercialisable products. A significant number of student projects, both undergraduate and postgraduate are on the shelves because there is no motivation to turn their ideas into products that can be sold to the general public or used to advance the country's technological advancement. In addition, the lack of a link between tertiary institutions and industries creates a rift that discourages mass production, adoption, and transformation of these projects into products that can be marketed to the general public.

One approach to address these issues is to implement a concept known as Acadopreneurship, which entails turning academic and research outputs into business ventures. This can be accomplished through ongoing collaboration and immersion programmes between academic institutions and industries in the pursuit of transforming academic outputs into sustainable businesses and start-up ventures. If this model is successfully implemented, graduates from tertiary institutions will no longer rely on the government for employment opportunities, but will instead have the drive, creativity, and innovation to transform their knowledge and skills into sustainable firms.

This model is presently being implemented by the Advanced Engineering Innovation Research Group (AEIRG), Federal University of Technology, Minna, and has resulted in the formation of several start-up companies based on academic ideas. Also, AEIRG has organised industrial immersion programmes for both students and faculty members, which help in boosting innovation and creativity while also providing a perspective on global demands. This, in turn, would not only establish a link between the students and the industry, but also inspires the students to turn their ideas into profitable start-up ventures. The successful implementation of this model throughout the country will result in a paradigm shift in which tertiary institutions and the

government will encourage students to be more creative and innovative in the areas of science and technology, which will in turn lead to global recognition and an improvement in Nigeria's technological as well as innovative rankings.

Oral Presentations

A Philosophical Appraisal of Artificial Intelligence and National Security: Towards Addressing Nigeria's Security Challenges

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Background: The study examines how artificial intelligence (AI) could be deployed in quelling the myriads of security challenges bedeviling Nigeria. National security is a non-negotiable right of every citizen of any country, Nigeria inclusive. It ranks top on the lists of priorities which any country owes its citizens, because ensuring a safe and stable environment for citizens occupies a central objective of any government. Consequently, whatever threatens the wellbeing of the people, and disrupts the nation's stability or its institutions, becomes a threat to national security. Nigeria as a country continues to grapple with the problems of insecurity, ranging from cyber terrorism and warfare, economic, political and military espionage among others. These problems are not unconnected with the vulnerable nature of our cyberspace and computer software, porous territorial boundaries, as well as poor policy implementation. The adverse effects have been loss of lives and properties, financial loss, vulnerability of vital information capable of damaging the reputation of the country, low productivity rate etc. the philosophy of artificial intelligence is brought to bear in this regard in addressing these challenges.

Methodology: This study employed the philosophical methods of textual and contextual analysis, where some credible works on Artificial intelligence were consulted. Some arguments concerning artificial intelligence were then highlighted. Some impacts of artificial intelligence, especially in some developed countries, were also analyzed, and how they compare to the Nigerian situation.

Results: Based on the analyses, the study suggests that rather than border on the comparative analysis of the two (man and machines) subject matter, we should rather appreciate the complementary effort of man and intelligent machines. This complementary effort will build a combating synergy between man and intelligent in human sustainability, especially in the area of security challenges. That through machine learning and programming, machines can comfortably take over some major tasks that defy human physical and mental abilities, with ease, speed and accuracy. The findings also explain how artificial intelligence could be helpful in managing natural disasters which have threatened the stability of Nigerian citizens.

Conclusion: The study recommends among others that, if the government of Nigeria, through the armed forces and other various security agencies, invest reasonably in the AI project, and further encourage other economic and financial institutions on the usefulness of these artificial machines, crime rate will be greatly managed if not totally eradicated.

Keywords: Artificial Intelligence, Intelligent Machines/robots and National Security

A Taxonomy of Simulation Tools in Vehicular Adhoc Networks (VANETS)

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Background: VANET Simulation software provides network and road traffic simulation. VANETs enable integration of mobility generators and network simulators on a single platform. Before now, traffic simulation and network simulation were implemented on two separate simulators, however, in recent times, simulation of both traffic and network is carried out on VANET simulators. Some VANET simulators are: Traffic and network simulation environment (TraNS), GrooveNet, National Chiao Tung University Network Simulator (NCTUns). Simulation tools are a very cheap and easy way of synthesizing systems before development of prototypes. Simulation saves researchers a lot of cost and assists in system study with good precision.

Methodology: In this paper, we x-rayed the different simulation software available in VANETS, their attributes and their popularity in the research space. We sampled publications from leading journals and studied the basis on which simulators are chosen. We compared the simulators based on their GUI, set up difficulty, ease of use and mobility models supported. We also studied mobility generators and network simulators and how they are paired for the simulation of vanets.

Results: Among the simulators studied, it was established that TraNs and Veins were the most widely used simulators in VANETS. This is because they are open source and easy to use among several other features. They have simple interfaces, they are c++based simulators.

Conclusion: In this paper, we have been able to x-ray the various VANET simulators as seen in literature. This paper therefore is a ready information source for researchers who wish to carryout research in the field of vehicular communications. It will help in reducing the time spent on trying to search for simulators for researchers.

Keywords: VANETS, simulation, simulators

Analysis of Expenditure Pattern and Household Food Security Status of MicroVeg Project Beneficiaries in Southwestern Nigeria

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Background: Achievement of no poverty and zero hunger of the Sustainable Development Goals is hinged on implementation of development interventions. MicroVeg project which synergised fertiliser microdosing with indigenous vegetable production is one of such interventions targeted towards economic and food security among resource poor farm families in southwestern Nigeria. This study analyzed the pattern of household expenditure and household food security among MicroVeg project beneficiaries in southwestern, Nigeria.

Methodology: Multistage sampling procedure was used to select a total of 277 indigenous vegetable farmers who were beneficiaries of IDRC sponsored MicroVeg project 107983 as study sample. Interview schedule was used to elicit information on respondents' socioeconomic and enterprise characteristics, monthly household food and non-food expenditure, household food security and coping strategies. Household food security was measured using FANTA Scale. Data were analysed using descriptive statistics, PPMC, ANOVA and multiple linear regression.

Results: Average age, farm size, household size, farming experience and annual farm income of beneficiaries were 46.20 ± 14.05 years, 2.10 ± 3.40 ha, 7.00 ± 5.20 persons, 20.40 ± 12.70 years and $\text{₦}864,844.90 \pm 1,447,850.00$, respectively. Most (83.0%) of the project beneficiaries sourced farm credit from personal savings, while 46.9% were marginal scale farmers. Monthly household expenditure on food, vegetable farms, children education and savings averaged $\text{₦}28,592.06 \pm 25,142.67$, $\text{₦}32,859.78 \pm 64,086.80$, $\text{₦}33,568.84 \pm 36,189.18$ and $\text{₦}38,959.03 \pm 73,739.81$, respectively. More than half (51.3%) of the sampled households were food secure. Coping strategies mostly used among respondents were modified cooking method (0.75), substituting commonly bought food items with cheaper ones (0.74) and reduced number of meals (0.72). Dependency ratio ($r=0.065$), indigenous vegetable output ($r=0.141$), farm income ($r=0.090$) and non-farm income ($r=0.010$) were significantly related to household food security. No significant difference existed in household food security among respondents sampled across the four selected project states. Age ($\beta=0.162$), dependency ratio ($\beta=0.350$), total farm size ($\beta=0.073$), vegetable farm size ($\beta=3.384$) and income from vegetables ($\beta=6.100$) significantly determined household food security of MicroVeg project beneficiaries.

Conclusion: The study concluded that close to half of the sampled respondents were still food insecure and recommended that concerted efforts be made via self-help and similar other intervention projects to enable more farmers cross the food security line on a sustainable basis.

Keywords: Expenditure pattern, Household food security, Coping strategies

De-globafriicalisation for Sustainable Research Impact: Research and Researchers' Assessments, Journal' Impact Factor and Other Metrifications

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Background: Western colonization of developing countries has long ended; however, it appears that many of the affected people, particularly Africans are still captive of the Western-imposed mentality and standards. 'Globafriicalisation', a newly coined term partly expressed as the westernisation of researches and research output from the developing world, particularly Africa was critically examined in this study.

Methodology: The emphasis on the global outlook and worldwide rating of researchers and their researches from the developing world partly prompted the research. The perspectives of researchers from the developing countries were sort through the administration of online survey and data obtained analyzed by subjecting it to a descriptive frequency distribution statistical analysis. The phenomenon of globafriicalisation which include the pressure to fit into this Western-imposed model despite the deficit of research support infrastructures may in part be fueling the push for global institution and researchers rating by various institutions.

Results: No doubt, all institutions want a high ranking on a global scale but the apparent questions are: what parameters are ranked, and how acceptable, reputable and transparently flawless are the processes involved? In the same context, academics and researchers ranking and/or assessment based on journal impact factor or citation metrics is inherently flawed with several consequences particularly for the developing nations; it not only impairs development of sound science but limits the development and sustainable exploration of indigenous knowledge for regional sustainable development. Numerous major flaws in researchers and institutions rating are highlighted in this work and the detail perspective of researchers in the region analyzed and recommendations made. It is obvious that as academia are drowning in the flood of 'globafriicalisation', research and indigenous innovations are most negatively impacted as both best brain and research output including publications and patents are carried headlong to the "advanced world" which is relatively saturated. Globafriicalisation undermines the full exploration

of African potentials to tackle her peculiar challenges and resource utilization. Therefore, the ‘de-globafricalisation’ of knowledge production, indigenous knowledge sharing and the general paradigm of the developing countries’ perception must be a priority for all stakeholders.

Conclusion: Obviously, developing countries must steer innovation and creativity and re-evaluate their overall priority, dependence on the western researchers and institution ranking/metric system, develop a sustainable metrification needed for their regional development and profitable exploration of indigenous knowledge, rapid sustainable regional development, competition, visibility and eventual global relevance. The globafricalisation crave that seems to promote the inter-continental collaborations and publications at the expense of intra-continental publications and national growth should be curtailed.

Keywords: Sustainable development; Researchers’ Assessment; Indigenous Knowledge

Disruptive Innovation Meeting the Demands of the Fifth Industrial Revolution (Wave) at Nigerian Universities

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Background: The aim of the presentation is to focus on the critical role that Innovation and Entrepreneurship Centres at Nigerian Universities, are playing to prepare graduates with transferrable 21st Century skills to become future-ready job creators. By entering the world of work, establishing a successful and profitable start-up business, these graduates can contribute to job and wealth creation in Nigeria. Innovative start-up businesses advocating and promoting Science and Technology, can make a major contribution to national growth and development in Nigeria. The presentation, furthermore, is highlighting the impact of the demands of the Fifth Industrial Revolution (Wave) on the Strategy and Direction (2022 – 2026) of Nigerian Universities in a new normal.

Methodology: The research was based on a comparative benchmark and literature study to identify the best practices regarding Innovation and Entrepreneurship Centres at leading national and international Universities. A snap survey based on structured focus groups, covering a randomly chosen population group of 100 subjects from two Nigerian Private Universities (N= 40 male and female lecturers) and (N= 60 male and female second year students) were conducted and administered.

Results: The research exposed that in the new normal there is a strong tendency at the two Private Universities to make use of lecturers, speakers, and other experts to present training programs in the Innovation and Entrepreneurship Centres, with the aim of making huge profits. Secondly it was uncovered that in the new normal digital Service Providers have created a multi – billion – dollar industry focusing on the innovation and entrepreneurship needs of Nigerian Universities.

An alarming warning was raised that after COVID – 19, Nigerian lecturers and students have reached a point of resistance and fatigue regarding Online Innovation and Entrepreneurship Courses.

Conclusion: The main research finding is clustered around the idea that Innovation and Entrepreneurship Centres must assist Nigerian Universities to become leaders in innovation and technology, to be ranked and rated as world – class, build on a solid pedagogical foundation of the universal principles of integrity, quality, and academic excellence. Every Nigerian University should take up the task and challenge to prepare students to become future – ready and face the demands of the Fifth Industrial Revolution (Wave) (5IR) (Space the New Frontier).

Keywords: Innovation, Technology, Entrepreneurship

Genetic Variations in Advanced Cowpea (*Vigna unguiculata* (L) Walp) Breeding Lines Exposed to Alpha Spin^R Nanoplates

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Background Nanotechnology has altered the properties of plant and offered many new and profitable products. Cowpea is a self-pollinated crop and there is need to generate additional variability among existing cultivars to broaden the gene pool

Methodology The study was carried out to investigate alpha-spin^R nanoparticles treatment on the molecular structure of 9 advanced cowpea seed varieties from Institute of Agricultural Research Samaru, Zaria. The varieties together with a control local variety obtained from Nasarawa Agricultural Development Programme (NADP), Lafia, were exposed to Alpha-Spin^R nano-plate at four (4) different time periods. These were 0minutes, 20minutes, 40minutes and 60minutes. The DNA of each of these samples was extracted from a three (3) days old seedling at Africa Centre for Excellence in Phytomedicine Research and Development (ACEPRD), Jos. These DNA samples were amplified using Maturase K (Matk) primer and Sequenced at Inqaba biotech West Africa, Ibadan. The physiochemical properties and protein functions were determined using expasy's protoparam and the protein structures were predicted using the phyre 2 server.

Results The results revealed different physiochemical properties of the sequenced samples as well as their amino acids compositions. Sampea 6 (40minutes), IAR 3391 (40minutes) and Sampea 5 (black) 60minutes contained significant quantities of limiting amino acids Methionine, Lysine, Tryptophan and Threonine. The rich content of Proline in Sampea 17 (40 minutes) resulted to the protein structure having more coils. The phylogenetic tree revealed closeness among the varieties in relatedness to the exposed Alpha spin^R timing. Relative studies of these elements suggest that the molecular weight, amino acids and Theoretical Isoelectric point differences among the sequenced samples will be helpful to understand their phenotypic expressions and biochemical effects.

Conclusion Considerable variability exists among alpha spin^R treated cowpeas and this information can be utilized for further breeding purposes for enhanced food security

Keywords: genetic variability, nanoparticles, food security

Glucagon-like Peptide 1 Receptor (GLP1R) Agonism Underlie *Sphenocentrum jolyanum*-mediated Hypoglycemia and Reversed Pancreatic Damage in Streptozotocin-Treated Adult Wistar Rats

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Background: Dysfunctional insulin metabolism is known to underlie hyperglycemia in patients with diabetes mellitus. *Sphenocentrum jolyanum* is an important treatment/management strategy in folklore but neither the phytochemical basis, nor the underlying mechanism has been investigated, thus, forming the basis for the current investigation.

Methodology: Activity guided fractionation coupled with LC-ESI-MS was used to characterize the major anti-diabetic phyto-compound in *S. jolyanum*, Molecular docking was used to delineate the putative target, Molecular Dynamics simulation was used to validate the interaction with the target (GLP1 receptor). *Ex vivo* pancreas culture-coupled with insulin release (ELISA) was used to validate the involvement GLP1R. Streptozotocin-treatment was used to induce pancreatic damage and hyperglycemia, RT-PCR method was used to examine key pancreas-b-cell regenerative genes following *S. jolyanum* treatment.

Results: LC-ESI-MS identified furanoditerpene as the anti-diabetic principle in *S. Jolyanum*, Molecular docking identified glucagon-like peptide-1 receptor (GLP1-R) as one of the major targets MD simulation supports the opening of GLP1R N-terminal lid and G-protein bound conformation only in furanoditerpene bound state. *S. jolyanum* purified furanoditerpene promotes *ex vivo* insulin release in Exendin-3 reversible manner. *In vivo* experiments confirmed *S. jolyanum* purified furanoditerpene dose-dependently repopulation of islet beta-cell following STZ damage which correlates with increased pancreatic insulin content and restoration of FBS levels to basal control levels, repression of p27, and upregulation of cyclin-D1, PCNA, and Ki-67 genes underlie pancreatic b-cell repopulation.

Conclusion: *S. jolyanum* is a potential source of novel anti-diabetic agents acting via GLP1-R agonism.

Keywords: *Sphenocentrum jolyanum*, Furanoditerpenes; GLP-1R; Diabetes Mellitus

Hybrid Pretreatment Modelling and Optimization for Enhanced Sugar Recovery from Fresh Waste Potato Peels

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Background: Fossil fuel depletion and the detrimental environment impact of gas emission has instigated the quest for alternative renewable energy sources, one of which is lignocellulosic biomass. Starch-based lignocellulosic biomass is a promising bioprocess substrate to produce biofuels, bioenergy and other valuable bio-products.

Methodology: This study modelled and optimized the production of reducing sugar (RS) from waste potato peels subjected to hybrid pretreatment of HCl and moist heat. The response surface methodology was used to optimize the hybrid pretreatment within the ranges of 0-5% HCl concentration, 5-25 minutes process time, and temperature (121oC).

Results: The coefficient of determination value (R²) of 0.989 was obtained for reducing sugar models indicating the suitability of the models to navigate the optimization space. The process optimization predicted an RS yield of 1.32 g/g on the hybrid pretreatment of 2.604% HCl for 8.86min at 121oC. Experimental validation of the model yielded reducing sugar of 1.041 g/g.

Conclusion: These findings further demonstrate that waste potato peels which usually constitute environmental nuisance can be an excellent renewable source of fermentable sugars to produce biofuels and other bioproducts, and for initiating biorefinery processes.

Keywords: pretreatment, optimisation, lignocellulosic, potato peels

In-silico Studies of Compounds from *S.kumba* and *S.aethiopicum* Eggplant Fruits on Enzymes linked to T2DM and its Inclusive-diet Effect in Diabetic-like C2C12 Cell Lines

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Background: Eggplant is a fruit plant commonly found in the tropical and temperate regions depending on the species they are useful in traditional medicine in West Africa. Type-2 Diabetes Mellitus (T2DM) affects 80% of those suffering from diabetes which is characterised by insulin resistance and hyperglycaemia. According to the International Diabetes Federation (IDF), T2DM is expected to rise by 75.8% by 2030, and it is prevalent in both rural and urban settings. The use of natural plant products to treat diabetes is on the increase due to the side effects of commercially available drugs therefore the study aimed was to investigate the molecular anti-diabetes property of these eggplant fruits found in Nigeria.

Methodology: Fresh eggplant (*S.kumba* and *S.aethiopicum*) fruits were oven-dried at 50°C and milled into flour for the experiment. HPLC-DAD analysis was done on the fruit flour to quantify the polyphenol compounds which was used for *in-silico* analysis docked with amylase, glucosidase and glut-4 proteins using AutodockVina. The genetic study on the anti-diabetes and antioxidative potential was determined on diabetic-like C2C12 cell lines using quantitative real-time polymerase chain reaction (qPCR).

Results: The HPLC-DAD revealed abundant of gallic acid, chlorogenic acid, caffeic acid, ellagic acid, rutin, quercetin, quercitrin, kaempferol and isoquercetin in (mg/g). A favourable binding interaction was observed between solanum-derived compounds with rutin having the highest binding pose with the amino acid residues with the proteins used in (kcal/mol). The eggplant fruit diet in C2C12 diabetic cell-line increased the glucose uptake by upregulating the expression of a glut-4 gene within (9-19fold) fold rate better than a known anti-diabetes drug.

Conclusion: This study confirmed the use of this fruit in the management of diabetes and the possible compound responsible for this effect is rutin which means that the eggplant fruit is rutin rich, thus could serve as a potential source of natural therapy for food security.

Keywords: cell-line; diabetes; rutin

Integration of Artificial Intelligence in the Radiology Department: Knowledge, Attitude and Perception of Radiographers and Student Radiographers in Enugu, Nigeria

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Background: The integration of Artificial Intelligence (AI) in healthcare is currently one of the most promising areas of health innovation and has continued to prompt increasing interests and researches. With its seemingly limitless power, it holds the promise to truly revolutionize practice especially in technology-driven disciplines like radiology. This study investigated the knowledge, attitudes and perceptions of radiographers and trainee radiographers in low income setting of Enugu, Nigeria regarding the integration of Artificial Intelligence (AI) in radiology department

Methodology: This qualitative study was carried among radiographers in two tertiary hospitals in Enugu and also among the fourth and final year students of the Department of Medical Radiography, University of Nigeria Enugu Campus. A questionnaire designed to evaluate the participants' knowledge, attitudes and perceptions of AI as well as their concerns about AI and its application in the radiology department was employed for the study.

Results: One hundred and ninety-six questionnaires were adequately filled by the participants. Of these participants, 38.3% were radiographers and 61.7% were students. Almost all the participants (88.7% of radiographers and 86.0% of radiography students) acknowledged that AI can speed up processes in health care and reduce medical errors. More than half of the participants were of the opinion that AI will help reduce radiation dose levels while maintaining optimal image quality. Eighty-nine percent of the radiographers and 76% of the students were willing to receive training in AI and will like to work in a Radiology department with fully integrated AI system. However, 52.7% of the radiographers and 63.7% of the students feared that AI might displace them from their jobs.

Conclusion: Based on these findings the integration of Artificial Intelligence into radiology department in low resource settings like Enugu, Nigeria would be a welcome development and a step in the right direction.

Keywords: Artificial Intelligence, Radiographers, Radiography students

Isolation, characterization and optimization of carotenoid producing yeasts from Pietermaritzburg, KwaZulu-Natal, South Africa

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Background: Naturally produced carotenoid pigments from yeasts are of value for the pharmaceutical, nutraceutical, cosmetical, and food industry and individuals as additives or health supplements in treating, for example, cardiovascular diseases. This is typically due to their

antioxidative properties neutralizing radicals affecting health and causing diseases. Certain yeasts are producers of beneficial carotenoids such as torularhodin.

Methodology: Carotenoid-producing yeasts were isolated from environmental samples collected in Pietermaritzburg (KwaZulu-Natal, South Africa). Three isolates were selected and further characterized. Moreover, biomass and carotenoid yields of growing cultures were determined and optimized using the Response surface methodology (Box Behnken). Similarly, carotenoid profiles were analyzed using thin-layer chromatography (TLC), UV-VIS spectrometry, and NMR spectroscopy. Additionally, yeast carotenoids' antioxidant and radical quenching potential were determined using a stable organic radical assay (DPPH) and spin trapping (DMPO) followed by ESR analysis.

Results: Based on physiological, morphological, and sequence (partial 18S rRNA gene) characteristics, the three selected carotenogenic yeast isolates (e.g., RF3, GA3, GG8) were identified as members of the genus *Rhodotorula*. Using Box Behnken-based optimization, maximum biomass (2.60 g dry weight/l) and pigment yields (0.63 mg/g dry weight) were obtained for strain RF3 with glucose as carbon source. However, when employing molasse, a low-cost agro-industrial waste, increased biomass (2.70 g dry weight /l, 2.78 g dry weight/l) and pigment yields (0.54 mg/g dry weight, 0.82 mg/g dry weight) were generated for strains GA3 and RF3. Via TLC analysis and UV-VIS spectroscopy, three main carotenoids were detected from all three isolates. The Rf values and spectral characteristics corresponded to those reported in the literature for similar carotenoids. NMR spectroscopy confirmed the carotenoids in strain RF3 as torularhodin, β -carotene, and torulene. The DPPH assay revealed that methanol extracts of all three yeast isolates and individual carotenoids isolated via preparative TLC exhibited antioxidant properties based on the DPPH assay. Furthermore, by using spin trapping and ESR analysis, the radical quenching potential of the yeast carotenoids was confirmed.

Conclusion: Yeast carotenoids have antioxidative potentials in neutralizing radicals affecting health and causing diseases.

Keywords: Carotenoid, antioxidant, optimization

Kinetics and Thermodynamic studies on the removal of Estrone and β -Estradiol (endocrine disruptors) from Aqueous solution by Eco-friendly Biomaterials from Agricultural Waste as a Potential Adsorbent

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Background: Steroid hormones are a class of medications that are prescribed for diverse human and veterinary purposes. 17 β -estradiol is extensively utilized as a human contraceptive pill for the birth regulator, and as a growth stimulator in feedlot ration of livestock animals. Essential portions

of steroid hormones administered to humans and animals are not fully metabolized by the body. Due to the challenge posed by the presence of steroids and other pollutants in water, researchers have been working towards developing low-cost materials that can be used to remove unwanted contaminants from water system. This has led to the usage of biomaterials from agricultural waste and nanomaterials for environmental pollutants like organics and dyes. Owing to the above, we report the use of *macadamia* nutshell activated carbon (MAC) as an effective adsorbent for the removal of endocrine-disrupting chemicals like estrone (E_1) and β -estradiol (E_2).

Methodology: The activated carbon material was characterized by Fourier transforms infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and thermal gravimetric analysis (TGA). The adsorption studies were performed in a batch manner using multi-stirrer in a sequence of Erlenmeyer flasks of 50 mL capacity sheltered to prevent contamination. The effect of time, temperature, concentration, and solution pH were studied. An equal quantity of adsorbent was added separately into each discrete flask, and the other parameters time, temperature, concentration, and pH were set different, and the flasks were agitated. The experimental adsorption data were used to evaluate the kinetic models like pseudo-first-order (PFO) and pseudo-second-order (PSO), thermodynamic, the Freundlich, and Langmuir isotherms model.

Results: The percentage effectiveness was higher in the acidic and neutral pH ranges, and the lowest pH ranges in the alkaline medium, exhibiting effect the surface charges of the activated carbon. The percentage of E_1 and E_2 adsorbed was observed at lower and neutral pH (4, 6, and 7). The sorption was very rapid in the first 25 min; hence the % removal reaching 60% for estrone (E_1) and 58% for β -estradiol (E_2). The adsorption of E_1 and E_2 increased progressively during the following 45 min until equilibrium is reached at about 90 min. Correlation coefficient (R^2) for PFO and PSO kinetic models for the sorption of steroids onto MAC were ($R^2 = 0.9872$) for E_1 and ($R^2 = 0.9916$) for E_2 . From the Langmuir isotherm, maximum adsorption capacity was found to be 22.0 mg/g. Thermodynamic factors: ΔG° values of -1.223 to -1.308 kJ/mol, $\Delta H^\circ = -11.72$ kJ/mol, and $\Delta S^\circ = 37.34$ J/mol k of steroids adsorbed onto MAC indicate that the adsorption was spontaneous, proceeded favourable at lower temperature and exothermic in nature.

Conclusion: Steroids adsorption capability of MAC was observed to be diminishing with an increase in temperature; therefore, signifying that the adsorption process was exothermic in nature. The negative Gibb's free energy value recommends that adsorption of phenol onto MAC was a spontaneous process. The isotherm and thermodynamic information attained all attest to the fact that the adsorption mechanism of estrone (E_1) and β -estradiol (E_2) could be mainly electrostatic interactions, supporting physisorption mechanisms.

Keywords: Endocrine Disruptors; Adsorption; Thermodynamic

Micropropagation Protocol Development for *Acacia senegal* (Gum Arabic) in Borno State of Nigeria

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Background: *Acacia senegal* is a draught resistant tree crop that is important for environmental protection in the Sahelian region. The exudate gum from this tree has substantial economic value for the community and the nation at large. Reforestation program with this tree improves the degraded soil and controls desert encroachment. Propagation through conventional methods is often limited by poor seed selection and storage, exacerbated by high mortality of seedlings in nursery. This research sets out to explore an alternative method of propagating healthy *Acacia senegal* in Borno State of Nigeria with the future view of mass propagation of the tree crop.

Methodology: Seedlings were raised from seeds acquired from a gum arabic tree plantation grown in Gubio Local Government Area of Borno State, Nigeria. Nodal segments were excised from 6-month old seedlings growing in the nursery and sterilized following standard aseptic technique. Sterilized explants were cultured on semi solid Murashige and Skoog (MS) basal medium supplemented with various concentrations of 6-benzylamino purine (BAP) (0.025–1.5mg/l), Kinetin (KN) (0.2–1.6mg/l) for shoot regeneration. MS full and half strength culture medium was supplemented with various concentrations of 2, 4-D (1.0– 2.5mg/l) for callus induction which was incidental. All cultures were incubated at 25°C ± 1 under photoperiod of 16/8 light and dark hours daily with exposure to 1,000 lux, provided by LED lamps.

Results: Results obtained indicate the superiority of BAP over KN in initiating shoot bud formation. The best shoot proliferation was observed on medium containing 1.0mg/l and 1.5mg/l BAP. Prolific callus formation was observed on full strength MS medium containing 2, 4-D at all the concentrations. Addition of KN to the auxin enhanced calli formation at concentrations 2.0mg/l 2, 4-D +0.5mg/l KN. Half strength MS medium yielded moderate calli formation that is hard and brownish white. Callus induction may be a promising pathway for the mass propagation of *A. senegal* tree for economic, reforestation and other programs.

Conclusion: The protocol for shoot regeneration and callus induction of *Acacia senegal* is developed and reported for the first time using the indigenous tree species in Borno State. This work can be further explored in the future for tree crop regeneration studies, somatic embryogenesis and improvement program in the species.

Keywords: *In-vitro* propagation, callus induction, nodal regeneration and nodal segment

Need for ICT Innovative Teaching and Instructional Strategy with Animation

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Background: The COVID-19 pandemic has affected all spheres of life, including the educational systems globally. The major effect of the pandemic on education in Nigeria was the mandatory closure of schools. As a result of closure, schools were obligated to adopt new strategy of teaching, as students were unable to come to classes and share the space and place with other classmates even amidst examination periods. Almost all educational institutions including the senior secondary schools applied distant or virtual learning, i.e. online learning as a substitute to face-to-face learning.

In the new paradigm of ICT learning, the role of students is more important than teachers. The concept of a paperless classroom is emerging as an alternative to the old teaching and learning method. Nowadays there is democratization of knowledge, as the role of the teacher is changing to that of facilitator. We need to have interactive teaching and this changing role of education is inevitable with the introduction of multimedia technology and the spawning of a technologically-savvy generation of youths.

Unlike the conventional teaching of the “chalk-and-talk” method, animation strategy is a multimedia strategy that involves the combination of various digital media types such as motion graphics, text, images, audio and video, into an integrated multi-sensory interactive application or presentation to convey information to an audience. Animation is discovered to be very important in the teaching process. If properly used, it provides a learning environment that will help learners to be more effective. The importance of animation in educational process is quite evident; animation holds great promise in the instructional process and has dominated the instructional practices in recent times.

Therefore, the present study intends to investigate the need of ICT multimedia teaching and learning using animation.

Methodology: The study made use of the quasi-experimental research design. The population comprised of the entire senior secondary school students in North Central Nigeria. The sample size consists of 151 students. Purposive sampling technique was used to select two schools for the study. Each school was found to have 80 (control group) and 71 (experimental group) science students in SS II. Both descriptive and inferential statistics of means (\bar{x}) and standard deviations was used to answer the four research questions while T-test was used to analyze the four research hypotheses at a significance level of 0.05 (5%).

Results: The findings indicated that the appropriate use of ICT innovative teaching and instructional strategy with animation enhances a better understanding of science concepts such as climate change.

Conclusion and Implication of the Study: The new paradigm shifts as a result of covid-19 pandemic school lockdown in 2020, gave the education sector a completely new role that was not earlier described in the transmission model of teaching using ICT innovative teaching and instructional strategy with animation. The implication of the findings of this study is that animation is a reliable tool for teaching and learning process. The use of animation in teaching and learning would significantly enhance students' achievement and retention rate.

Keywords: ICT, animation teaching strategy, achievement and retention

Performance and Emission Characteristics of Baobab (*Adansonia digitata*) Biolubricant in Four Stroke Spark Ignition Engine

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Background: Petroleum-based fossil fuels have been dominant transport fuel since the beginning of mechanized mobility in nineteenth century. Predicted exhaustion of fossil fuels in foreseeable future, according to the analysis made by the British Petroleum (BP) in the Year 2011, global oil proved reserve rose to 165.6 billion barrels at the end of the year 2011 and was potentially adequate to meet supply in 54.2 years of the world oil production and environment pollution concern provide motivation for the search of renewable alternative fuel for the transport sector which would have relatively lesser harmful impact on the environment. The problem of oil spillage during drilling or transportation mineral oil leaves the environment polluted causing harmful effects to living organism on land and water and the cost of remediating the damage is very high.

Methodology: The extracted baobab oil was purified, degummed and epoxidized to form biolubricant. The physicochemical properties were determined. Engine performance and gas emission on the baobab biolubricant and standard fossil lubricant was carried out on stationary spark ignition engine.

Results: The engine speed and the load were varied as 2000rpm, 2500rpm and 3000rpm and 2, 4, 6kg respectively. It was observed that the increases in CO emission of baobab lube at 3000rpm, 2500rpm are 4.1%, 1.0% respectively compared to standard lubricant at rated power. The trend was similar for HC and CO₂ emission compared to standard lubricant.

Conclusion: It was observed that for both lube oils the CO, HC, CO₂ emissions were comparable with little differences showing on both sides.

Keywords: Baobab lubricant; exhaust emission and engine performance

Physics Education: A Necessary Tool for National Security and Development in Nigeria

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Background: Nigeria as a nation is blessed by enormous human and natural resources. It is true that the exploitation and utilization of these resources will no doubt enhance the development of the Nigerian nation but in spite of these resources, sales and generation of revenues, and other forms of utilization of these resources, the nation is bedeviled by serious cases of insecurity and crises of development. Thus, the knowledge of science (Physics Education) is crucial for effective living in this digital modern age. Its application in industries and many other professions are necessary that every student should be given an opportunity to acquire some of its concepts, principles and skills.

Methodology: Descriptive Method

Conclusion: The education system of any nation still remain the foundation upon which the individual and societal growth, advancement and transformation rests. Every country should as a matter of necessity improve on physics education in a way it will serve her in the provision of national security and development more to the benefit of the society.

Keywords: National Development, National Security, Physics Education

Preparation and Characterization of Silver Nanoparticle-Doped Strontium Aluminate for the Development of Traffic Paint

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Background: The discovery of rare earth based phosphors in 1960s started a new era of luminescence. In comparison with sulfide-based phosphors, strontium aluminates received worldwide acceptance because of their chemical stability and good luminescent properties especially when doped with rare earth metals such as europium (Eu), dysprosium (Dy) and their phosphorescence last for more than 15 h. The review extensively deals with the synthesis of Strontium Aluminate luminescence, their synthesis technique and their characterization technique.

Methodology: Strontium aluminate doped with different ratios of silver nanoparticles ($\text{SrAl}_2\text{O}_4:\text{AgNPs}$) were prepared via so-gel method. All reagents used in this study are of analytical grade and were used without further purification. Stoichiometry amount of $\text{Al}(\text{NO}_3)_3$, $\text{Sr}(\text{NO}_3)_2$ and different ratios of AgNO_3 were dissolved in 100ml acetic acid, 2ml of ethylene glycol was added, after stirring for one hour, the solution was evaporated to form gel. The gel was oven dry, ground into fine powder and then it was further sintered at 900 °C and subsequently characterized

by high resolution transmission electron microscope (HRSEM), selected area electron diffraction (SAED), X-ray diffraction (XRD) and photoluminescence (PL).

Results: The XRD reveals crystalline nature with no other phase shown in the XRD spectra. The obtained product (SrAl₂O₄:AgNPs) was indexed to body-centered cubic phase it can be noticed that the SrAl₂O₄ with low dopant are with peaks of low intensity, but with an increase in the ratio of dopants the intensity of the peak increases. TEM images of the product (SrAl₂O₄:AgNPs) showed a morphology of spherical shape and isolated agglomerated grains. The PL emission spectra show peak of 550nm which is within the UV visible.

Conclusion: Sol-gel method was employ to synthesized SrAl₂O₄:AgNPs. The XRD pattern shows the phase formation of the SrAl₂O₄ doped with different ratios of AgNPs phase. XRD analysis shows that the prepared phosphor retains the monoclinic phase of SrAl₂O₄. The TEM image confirms the regular shape that was produced from the sol-gel method. The emission spectra of the luminescent phosphor showed a broad peak at 550nm. The obtained results indicate a promising prospect for further development of the product into traffic paint.

Keywords: sol-gel, luminescence, characterization

Radiological Hazard Assessment of Natural Radionuclides in Soil Samples from Farmlands of Oil Producing Area of Ohaji-Egbema in Imo State, Nigeria

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Background: Considering the fact that human beings are constantly exposed to ionizing radiation through direct skin exposure, inhalation of contaminated air and ingestion of natural radionuclides and Ohaji-Egbema is densely populated, industrially active and also the food basket of the entire Imo state and its environs, it is of great significance to assess the radioactivity concentration level of the area and its radiological effect.

Methodology: The activity concentration of natural radionuclides (²²⁶Ra, ²³²Th and ⁴⁰K) were measured in soil samples collected from three sampling points from each of the eight communities considered (total of 24 sampling points) in Ohaji-Egbema in Imo state, Nigeria. The samples were analyzed by gamma spectrometry using the NAI(TI) detector. The radiological hazard on the environment and the populace due to the radiation exposure from natural radionuclides in soil samples collected from the study area was assessed.

Results: The average values of the Radium Equivalent (Raeq), Gamma Absorbed Dose Rate (D), External Hazard Index (Hex), Annual Effective Dose Equivalent (AEDE) and Excess Life Time Cancer Risk (ELCR) were 269.41Bqkg⁻¹, 125.01nGyh⁻¹, 0.68, 0.16μSvy⁻¹ and 0.55 respectively.

Conclusion: Although all the mean evaluated radiation hazard indices were lower than the permissible limits set by ICRP, but the values are higher in some areas where crude oil exploration is ongoing. This shows that oil and gas exploration activities in this study contributed to the radiological hazard on the populace of Ohaji-Egbema and its environs.

Keywords: Radionuclide, Ohaji-Egbema, radiation, hazard

Role of Science, Innovation and Entrepreneurship in National Development

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The need for science, innovation and entrepreneurship in national development in Nigeria and Africa at large cannot be overemphasized. It is now very obvious that the indispensable role played by science, innovation and entrepreneurship in sustainable development of any nation and hence their application to security management cannot be overlooked. This paper sets to identify the strategies and challenges facing research in science, innovation/ entrepreneurship, employing narrative analysis: interviews of respondent. The result from this paper emphasizes the fact that science and innovation constitute the foundation for successful sustainable development and security management of a nation. National security cannot be guaranteed if research in science and innovation is not properly addressed. Challenges facing development of science and innovation/entrepreneurship are discussed and strategies for encouraging development are suggested. It is evident from this paper and from other discussions, that we have a series of wonderful ideas; what we need now is to work hard and put in a lot of efforts to ensure that implementation of these lofty ideas will not elude us. In conclusion, it is recommended that most of the strategies suggested should be implemented, so that adequate involvement of research scientists in development of science and innovation focused in national security management will be a reality and not a concept. Hence, a way forward is proffered.

Keywords: Science, Innovation, Entrepreneurship

Safety Assessment of the Crude Methanol Extracts of Fruits of *Sarcocephalus latifolius* (SMITH) BRUCE Using *Drosophila melanogaster* as a Model

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Background: Healing with medicinal plants is as old as mankind itself. The connection between man and medicine in nature dates from the prehistoric days. The only option man had at that time was the use of certain plant's parts as drugs for healing, which proved effective but only had paucity of information on scientific prove of the active ingredients responsible for the action. The fruit of *Sarcocephalus latifolius* (SL) is used in folkloric medicine to treat tumours. This study was designed to investigate the safety assessment of the crude methanol extracts of fruits of *Sarcocephalus latifolius* (SMITH) BRUCE using *Drosophila melanogaster* as a model.

Methodology: The fruits of SL were harvested, washed, air-dried, pulverised and soaked in methanol to obtain the Crude Methanol Extract (MSL), freeze-dried and used for the study. *Drosophila melanogaster* was used as a model, to perform pharmacological and toxicological activities of chemical compounds and natural products. Therefore, the effects of crude methanol fraction of fruits of *S.latifolius* on survival, locomotor, behavior, neurotoxic effect and antioxidant defenses in *D. melanogaster* were evaluated. Both sexes of the *D. melanogaster* wild-type (Harwich strain) flies were maintained and reared in Drosophila Laboratory, Biochemistry Department, University of Ibadan, Nigeria on standard diet at constant temperature and humidity (22–24 °C; 60–70% relative humidity) under 12 h dark/light cycle conditions. The study was carried out in two modes - the *ex vivo* and *in vivo* study. For the *in vivo* studies, six groups of fifty flies exposed to varying concentrations of the crude methanol extract of SL, MSL for a period of 7 days was used. Group 1(vehicle alone), groups 2-6, had (0.1, 0.2, 0.5, 1, 10mg/kg diet) respectively. Thereafter, evaluations for the behavioural, inflammatory, oxidative stress, antioxidant status and the eclosion rate were assessed. Biochemical tests including acetylcholinesterase (AChE), catalase and glutathione S-transferase (GST) activities, total thiol (T-SH), glutathione content (GSH) and hydrogen peroxide (H₂O₂) levels, were assessed using standard methods. Data was analysed using the Kaplan-Meier Method, long-rank tests, ANOVA and Dunnett's post hoc test at $\alpha_{0.05}$.

Results: *Ex vivo*, MSL improved the survival rates of *D. melanogaster*, but had a non-toxic effect on the eclosion rate and locomotive capacity. *In vivo*, MSL exhibited a dose-dependent reduction in NO levels (55%), depletion of LPO and H₂O₂ levels across all the groups compared to the control group, (Group 1). Furthermore, our results demonstrate that MSL did not lead to any form of alteration in the antioxidant defense system (GST, CAT and TSH and GSH levels) of the flies, maintained GST activity while improving GSH and total thiol level in *D. melanogaster*.

Conclusion: In conclusion, MSL possesses anti-inflammatory, antioxidative and free radical scavenging properties moderated the activity of AChE and is safe for *D. melanogaster* (fruitfly), thus supports the safety of the fruits of *Sarcocephalus latifolius* and other parts of this plant used in traditional medicine.

Keywords: *Sarcocephalus latifolius*, *D. melanogaster*, antioxidant defense system

The Role of Oil and Gas Companies in the Energy Transition during the PIB ACT 2021 Era

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Background: The oil and gas industry has a significant impact on Nigeria's economy. Though the industry contributes less than 10% to the country's gross domestic product, it contributes about 90% of the foreign exchange earnings and 60% of total income. Consequently, any adverse change in the industry will have a big and long-term impact on government finances. This is the reason why successive governments have remained focused on the sector despite various discussions on diversifying the economy. For the past 20 years, there have been various attempts at reforming the industry. However, none of these efforts has yielded any tangible result until the introduction of the Petroleum Industry Bill (PIB) 2020 and assented to law in 2021. Also, in the 21st century the oil and gas industry faces opposition from a public greatly concerned with the environmental impact of fossil fuels, ever-more skeptical shareholders, and challenges from policy makers seeking to simultaneously meet decarbonization goals and expected oil and gas demand. Oil and gas companies were seen to major contribution on the effect of environmental and major player in the quest for energy transition. The PIB ACT 2021 is expected to serve as the check and balance instrument within the oil and gas companies and help define pathways for the transition.

Methodology: Use of exploratory research tools, this paper x-rayed oil and gas companies in the transition in the Nigerian energy sector with the aim of providing observations that influence on oil and gas companies transition during the PIB era. Data collated and analyzed from both primary and secondary sources were deployed employed for coming up with the attained outcomes.

Results: The findings reveal that oil and gas companies' transition will lead to: Build strategies for low carbon business models that minimize carbon use while remaining profitable, and articulate these strategies clearly to markets and other stakeholders; Support the development of ESG metrics that are transparent, objective, and accessible to investors; Invest in the promising concepts of net zero emissions and the circular economy while adhering to the nationally determined contributions model of the Paris Agreement; and Develop a workforce strategy that leverages the above into restoring oil and gas as an attractive destination for younger talent concerned about the ESG footprint and stranded asset risk of the industry.

Conclusion: Oil and Gas companies and the PIB ATC 2021 will play a vital role in energy transmission in Nigeria. Surviving, thriving, and leading the low carbon energy transition. The range of policy, investor, and social pressures on the growth case for oil and gas does not preclude a significant and vital role for the industry in the low-carbon energy transition. Multiple pathways for decarbonization include oil and gas when partnered with the right technologies and policies.

Keywords: Energy policy, Conventional energy, Renewable energy

Poster Presentations

A Comparative Study of the Condition Factor, Length-Weight Relationship and Sex Ratio of *Clarias gariepinus* (Burchell, 1822) (African Mudfish) from Selected Controlled and Uncontrolled Populations in Zaria, Nigeria

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Background The current novel Corona virus pandemic has changed the health and food security narratives in countries around the world, especially in sub-saharan Africa. To boost food production and population immunity, this paper evaluates condition factor (K), length-weight relationship (LWR) and sex ratio of *Clarias gariepinus* from selected controlled and uncontrolled populations in Zaria, Nigeria.

Methodology A total of three hundred and sixty (360) fish samples were collected from controlled (cultured population) and uncontrolled (wild population) across the dry and wet seasons. Morphometric measurements were made using standard procedures.

Results The mean total length and body weight recorded were 35.06 ± 5.13 cm; 318.05 ± 146.75 g and 30.69 ± 7.51 cm; 232.45 ± 154.89 g for controlled and uncontrolled population respectively. The mean condition factor was 0.720 ± 0.24 and 0.70 ± 0.22 K for controlled and uncontrolled environments, respectively. Though there were variations in the different morphometric data between and among the two population types evaluated, only mean total length recorded significantly higher ($p < 0.05$) values for samples collected from controlled population than those from uncontrolled population. The values recorded for length-weight relationship from controlled and uncontrolled population were $W = 0.013L^{2.799}$ and $W = 0.023L^{2.669}$ revealing allometric growth. The mean condition factor of fish from controlled and uncontrolled were relatively low (< 1.00), while the sex ratio was 1.00:1.52 and 1.00:1.47 for samples from controlled and uncontrolled environments, respectively.

Conclusion These results provide baseline information on some basic morphometry of *Clarias gariepinus* from different culture environments in Zaria, northern Nigerian for possible utilization in planning sampling strategies and in assessing the health status of fish, especially in this part of Nigeria. The not-so-marked heterogeneity in morphometric data between the two populations suggests that, environmental factors, rather than location are the most important determinants of the condition factor and consequently, optimum fish production, especially in this COVID 19 era in which food security has become a major challenge.

An Overview of Industrial Property Growth Efforts and Development in Nigerian Knowledge Institutions from 2016-2020

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Universities are one of the recognized knowledge institutions worldwide from where innovative efforts are developed and transferred to the industry for mass production and enhance national development. It is a well-known fact that talents in Nigerian universities are huge depository, diverse and valuable to the general economy. Unfortunately, these hidden treasures have not been significantly exploited in driving national economic growth. Innovative talents in the universities are measured by the acquisition of Industrial Property (IP) Rights developed, owned and commercialized by the universities subsidiary companies. About 70% of global business enterprises are driven on industrial property portfolios -patents, trademarks, industrial designs, etc. These IPs have critical needs and valued commercial implication for industrialization. It is a global trading component in the World Trade Organization (WTO) Agreement as Trade Related Aspect of Intellectual Property (TRIPS). Millions of Dollars are involved the acquisition of patents or trademarks while executing Foreign Direct investment in any region. About 70% of these properties are produced by the knowledge institutions-universities, polytechnics, research institutes etc. It brings strong beneficial socio-economic relationship for both the university and industry. On its commercialization, it has the capacity to expand university research activities, improve internally generated revenue, learning infrastructures and competitiveness. The awareness of industrial property and its role in national development is not significantly appreciated and utilized. Unfortunately, Nigerian university authorities are yet to tap from these innovative talents in the universities to improve its ranking in the global scale. In 2020, no Nigerian university was found within the first 250 best universities in the world. This paper would attempt to provide an overview of industrial property (Patents) owned by the Nigerian universities, while noting down some achievements and challenges. It would also make some strategies and policy recommendations to uncover talented innovations in the Nigerian universities.

Keywords: Innovations, industrial property, universities

Activities of some Oxidative Stress Enzymes and Carbohydrate Metabolizing Enzymes in Relation to Desiccation Tolerance in two Cabinet Rainforest Species:

Afzelia africana Sm. and *Chrysophyllum albidum* Linn

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Background: Plants in response to stresses generate and accumulate significant levels of reactive oxygen species (ROS). Their cells are able to neutralize ROS through an elaborate antioxidant

defense system consisting of ROS-scavenging enzymes and antioxidants. This study investigated the effects of desiccation on the activities of some oxidative stress enzymes (Peroxidase, Catalase and Polyphenol Oxidase), enzyme of the reductive Pentose Phosphate Pathway (Glucose-6-phosphate dehydrogenase), and the activities of some carbohydrate metabolizing enzymes, α -amylase, β -amylase and total amylases.

Methodology: This study was carried out in Calabar, the capital city of Cross River State, Nigeria. The laboratory investigations were carried out in the Graduate Research Laboratory of the Department of Plant and Ecological Studies, Faculty of Biological Sciences, University of Calabar. Mature seeds of *Azizelia africana* and *Chrysophyllum albidum* were obtained by harvesting mature fruits from their tree stands; seeds were desiccated at ambient condition. Desiccation period, in days, included 0, 3, 7, 10, 13, 15, 22 and 35. Seeds of each species, on collection and following desiccation, were assayed for enzyme activity.

Results: Activities of peroxidases decreased during the initial desiccation period in seeds of *A. africana* while increasing in seeds of *C. albidum*. Similarly, activities of α -amylase, β -amylase and total amylases in seeds of both species increased during the initial desiccation period (0-7 days). Thereafter, amylolytic activity decreased significantly. *A. africana* showed significantly higher ($P \leq 0.05$) amylolytic activity while seeds of *C. albidum* had higher levels of catalase and Glucose-6-Phosphate dehydrogenase activity. Seeds of *Azizelia Africana*, with orthodox characteristics, showed an increase in oxidative stress enzymes activity; this was not the case with seeds of *Chrysophyllum albidum* having recalcitrant characteristics.

Conclusion: This suggests enzymatic antioxidant system and increased amylolytic activities as protective systems developed by plants to confer desiccation tolerance.

Keywords: Desiccation, Enzyme activity, Reactive oxygen species

Administration of Online Teaching and Learning and Students' Academic Performance in Universities in Kwara State, Nigeria amidst COVID-19 Lockdown

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Background: The Federal government of Nigeria through the minister of education had on 23rd March, 2020 announced the immediate suspension of all educational activities. Schools (including elementary, secondary and tertiary institutions) in the country have suspended all classroom activities and other academic events such as conferences and seminars among others, as a way of promoting the stay at home principle which is the only ray of hope for safety pending when a vaccine or cure to the disease will be discovered. This measure forced over 46 million students across all levels of education to abandon their schools following the closure notice given by the government. As a result of the foregoing, few universities in Nigeria switched to online mode of

teaching students. It is on this premise that this study examined administration of online teaching and learning and students' academic performance in universities in Kwara State, Nigeria. This study employed descriptive research design of correlation type. Three research questions were generated to guide the study. The questions include:

1. What are the administrative strategies put in place in online teaching and learning in Universities in Kwara State amidst COVID-19 pandemic?
2. What is the level of students' academic performance based online teaching and learning Universities in Kwara State amidst COVID-19 pandemic?
3. What is the relationship between administration of online teaching and learning and students' academic performance in universities in Kwara state amidst COVID-19 pandemic?

Methodology: The research design adopted was descriptive design of correlation type. The population consists of all lecturers in universities in Kwara State. Stratified and simple random sampling techniques were used to select 352 sample size for the study. An instrument titled "Administration of Online Teaching and Learning Questionnaire (ATALQ) was adapted to elicit data. Students' Academic Performance Profoma (SAPP)" was used to collect 300 level students' results in five GNS courses. Data collected was analyzed with the use of Statistical Package for Social Sciences (SPSS) and Partial Least Square Software (PLS-SEM).

Results: Findings indicate administrative strategies put in place for online teaching and learning include planning strategy, coordinating strategy and supervision strategy. Also, path analysis results indicate a significant relationship between administrative strategies and students' academic performance.

Keywords: Administrative Strategies, Online Teaching, Lockdown, Partial Least Square

Agricultural Undergraduates' Perception of Farm Based Self Employment in Osun State, Nigeria

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Background: The study was carried out to assess agricultural undergraduates' perception to farm based self-employment in Osun State.

Methodology: A multistage stage sampling technique was used to select one hundred and twenty (120) respondents while structured questionnaire was used for data collection and analysis done using descriptive and inferential statistics.

Results: The results of students' perception regarding agricultural entrepreneurship revealed that the respondents agreed that agricultural related enterprise is lucrative (93.4%), has high potential for self-employment (95.0%), and has high prospects of success (87.5%) with lots of untapped potentials (80.9%). Implement repairs (71.2%), Government policies (70.3%), start-up capital (67.8%), problem of marketing (64.4%), poor access to market (64.4%), theft and poor access to equipment (57.6%) and spoilage due to poor amenities and provision of social extension consultancy services (56.8%) were major constraints identified in the study area. Majority (87.2%) of the respondents would not engage in entrepreneurship farm based self-employment because of fear of access to grant credit and soft loan, followed by market risk (80.3%). The correlation matrix between fear score of the undergraduates and their perception aggregate revealed that fear score ($r= 1$; $p= 0.000$), perception aggregate ($r=-0.192$; $p=0.042$), constraints score ($r= -0.285$; $p=0.002$), suggestion score ($r=0.592$; $p= 0.000$). Perception score is significant at 0.05 levels while constraints core and suggestion score is significant at 0.01 levels.

Conclusion: It was recommended that funds and access to capital be made available to the respondents to facilitate self-employment. Also, Government should improve on the policies that aid agricultural development in Osun state. In the same vein, training be organised for the undergraduates on the technicality of farm machineries for them to be able to repair implements which at present is a constraint to them.

Keywords: Undergraduates, Perception, Self employment

Analysis of Cutting Properties of Nano Alumina-Based Cutting Fluid Developed from Baobab Oil

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Background: This paper presents an investigation on the effect of an eco-friendly bio-based Nanofluid on tool life, rake angle, and surface quality during the turning of mild steel.

Methodology: Machining trials under different cutting conditions were performed using different ranges of rake angles, cutting speeds and lubricating time. Dispersed Alumina in Baobab-oil was used to produce the nanofluid, which was used as the cutting fluid during the machining process at three different nanoparticles concentrations. To effect of the varied process parameters was further investigated on the output parameters (Tool life, surface quality and sizes of chips formed).

Results: The results indicated that wear rate and surface quality of high-speed steel tool significantly vary at different rake angles. The nanoparticles concentration, rake angle, cutting speeds, and the lubricating interval for cutting fluid significantly affect the surface quality and tool wear.

Conclusion: The capability of high-speed steel to wear and the surface quality during the turning operation is highly dependent on the rake angle and cutting speed.

Keywords: Nanofluid, Tool wear, Rake angle, Surface quality

Analysis of Thermal Properties of Nano Alumina-Based Gear Oil Developed From Effluent of Lube Oil Blending Plant

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Background: Industrial wastewater, also known as effluent has been identified as one of the leading sources of environmental pollutions worldwide. The establishment of lube oil blending plants in Nigeria has led to a continuous discharge of industrial effluent in densely populated areas that threatens the well-being of humanity, plants, aquatic lives and even construction soils. This paper focused on producing a nano Al₂O₃ lubricant for extreme pressure application from lube oil blending plants effluent oil as an alternative means of mitigating its threats to the environment.

Methodology: The Alumina nanoparticles were synthesized using co-precipitation method, which were then characterized using Fourier transform infrared (FTIR), X-ray diffraction (XRD) and scanning electron microscopy (SEM) equipment. To understand the behaviour thermal of the alumina nanomaterials, the thermal properties of nano alumina-based gear sample was investigated after varying the weight percentages of Al₂O₃ nanoparticles in order to obtain the best sample among the samples produced.

Results: The results showed that, the pure effluent oil recovered is more thermally than the 0.4 wt.% nano alumina-based gear oil sample, while the nano gear oil sample has a higher thermal conductivity than the pure effluent oil.

Conclusion: The nano gear oil thermogram ensured the stability up to 90°C. This affirmed that the sample can serve well as gearbox oil.

Keywords: Industrial effluent, Nano lubricant, Thermal properties

Anti-anaemic Activity of Aqueous Extract of *Abrus precatorius* Leaves in Iron Deficient Rats

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Background: *Abrus precatorius* leaves have been claimed in folk lore medicine of Nigeria to be used in the management of anaemia without any scientific evidence that substantiated the claim. Thus, the current study investigated the anti-anaemic activity of *Abrus precatorius* leaves in anaemic rats.

Methodology: Fifty weaning rats (46.20 ± 7.51 g) were used for the experiment. Ten animals each in groups A and B were maintained on commercial rat chow and iron sufficient diet whilst thirty rats in group C were maintained on iron deficient diet (to induce anaemia) for 8 weeks. The iron deficient animals in group C were again sub-divided into C1, C2 and C3 and administered orally 100, 200 and 400 mg/kg body weight of aqueous extract of *Abrus precatorius* leaves for 2 weeks.

Results: The moisture, ash, crude lipids and nitrogen free extracts of the iron deficient diets were lower than those of iron sufficient diets whereas the crude fibre and crude protein contents of iron sufficient diets were lower than those of iron deficient diet. The iron deficient diet significantly ($p < 0.05$) reduced the levels of red blood cells, haemoglobin, packed cell volume and mean corpuscular haemoglobin as well as the growth of the animals when compared with those animals that were exposed to the iron sufficient diet. The iron deficient diet-treatment related decreases in the levels of red blood cells, haemoglobin, packed cell volume, platelets, white blood cells, gastric pH and increased soluble transferrin receptor were significantly ($p < 0.05$) reversed by all the doses of the aqueous extract of *Abrus precatorius* leaves with the 400 mg/kg body weight significantly elevating the levels of packed cell volume higher than those of rats maintained on iron sufficient diet and the commercial diet.

Conclusion: The aqueous extract of *Abrus precatorius* leaves exhibited anti-anaemic activity with the 400 mg/kg body weight producing the most profound effect. This study has provided scientific justification to the acclaimed use of *Abrus precatorius* leaves in the management of anaemia.

Keywords: *Abrus precatorius*, Anti-anaemia, Fabaceae

Antibacterial properties and Phytochemical Screening of Aqueous Extract of Fresh and Dried *Carica Papaya* (Paw-Paw) Leaves

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Background: *Carica papaya* (paw-paw) leaves are largely used traditionally to treat various ailments in Nigeria, this is usually attributed to the presence of naturally occurring compounds in plants known as phytochemicals, as such this study evaluated the antibacterial properties and phytochemical composition of aqueous extract from its fresh and dried leaves.

Methodology: Extraction of bioactive compound from the leaves was carried out via solvent extraction using distilled water as the solvent, the presence of phytochemicals were determined qualitatively base on color change and appearance. The antibacterial analysis were carried out on *E coli* and *Pseudomonas* Spp grown on potato dextrose agar with sensitivity disc prepared from the leaves extract using penicillin antibiotic disc as control.

Results: The results showed inhibitory activity with both fresh and dried aqueous leave extract for both species, with increased inhibition zone from 5mm (at 10mg/ml) to 13mm (at 50mg/ml) for *Pseudomonas* Spp, however, the inhibition activity was shown to decrease when the concentration was increased to 100mg/ml. Alternatively, with *E coli* the inhibition zone increases with increase concentration from 11mm at 50mg/ml to 18mm at 100mg/ml of the fresh extract while, no inhibition was observed at less concentration; 10mg/ml. No inhibition zone was observed with minimum concentration (5mg/ml) of dried extract for both bacteria, while highest inhibition zone observed was (*E coli*; 11mm and *Pseudomonas* Spp 5mm) with 100 mg/ml of the extract. This activity seems to be related with high composition of saponins (+++) in the fresh leave extract. The decrease in activity in dried leaves might be due to the decreased saponin (+), while increased flavonoids and tannins from (+) in the fresh to (++) in dried extract seemed to contribute to the minimum inhibition.

Conclusion: *Carica papaya* is a good inhibitory agent of *Pseudomonas* Spp and *E coli*, and also the result showed processing to have considerable effect on the phytochemical composition of the leaves.

Keywords: *Carica papaya*, Phytochemical, inhibition

Anti-Hyperprolactinemic Activity of Aqueous Extract of *Uvaria chamae* Roots in Chlorpromazine-induced Hyperprolactinemia in Male Wistar Rats

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Background: The age-long folkloric claim of *Uvaria chamae* roots in the management of hyperprolactinemia is yet to be substantiated with scientific evidence. Therefore, this study investigated the anti-hyperprolactinemic activities of aqueous extract of *Uvaria chamae* roots (AEUCR) and associated biochemical changes in chlorpromazine (CPZ)-induced hyperprolactinemia in male Wistar rats.

Methodology: A total of sixty male rats (207.40 ± 2.69 g) were assigned into 6 groups. Animals in Group A (naïve control) received 0.5 ml of distilled water only while those pre-treated with CPZ (to induce hyperprolactinemia) in groups B, C, D, E and F also received distilled water (negative control), 2.5 mg/kg body weight of bromocriptine (reference drug, positive control), 0.71, 1.41 and 2.83 mg/kg body weight of AEUCR for 28 days.

Results: Administration of CPZ significantly increased ($p < 0.05$) the levels of both the prolactin and progesterone whereas it significantly ($p < 0.05$) reduced the levels of testosterone, estradiol, follicle stimulating hormone (FSH), luteinizing hormone (LH), dopamine, triiodothyronine (T3) and tetraiodothyroxine (T4). Furthermore, CPZ increased ($p < 0.05$) the levels of serum urea,

creatinine, total protein, albumin, globulin, bilirubin, alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) of the animals. In contrast, AEUCR significantly ($p < 0.05$) reduced the CPZ-treatment related increases in the levels of prolactin and progesterone as well as increased the levels of CPZ-treatment related reduction in testosterone, estradiol, FSH, LH, dopamine, T3 and T4 to levels that were not significantly different from the naïve control. The AEUCR also reversed ($p < 0.05$) the CPZ-treatment related increases in the levels of urea, creatinine, total protein, albumin, globulin, bilirubin, ALT, AST and ALP in similar pattern to those of distilled water treated naïve control and bromocriptine-treated control. The CPZ-induced remarkable lobular pattern (female pattern) with indistinct lumina (atrophic changes) in the mammary gland was restored to a well preserved tubule-alveolar male-pattern characterised by well-defined branching duct and small alveoli budding off the duct.

Conclusion: Aqueous extract of *Uvaria chamae* roots exhibited anti-hyperprolactinemic activity in male rats and ameliorated biochemical changes associated with hyperprolactinemia.

Keywords: *Uvaria chamae*, Hyperprolactinemia, Hormones

Antimicrobial Susceptibility Profile and Molecular Identification of *Acinetobacter baumannii* in Alex Ekwueme-Federal University Teaching Hospital, Abakaliki, Nigeria

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Background: *Acinetobacter baumannii*, a notorious opportunistic pathogen known to seriously affect debilitated individuals especially intensive care unit (ICU) patients and others with underlying illness, have consistently jeopardized many antibiotics. This study was therefore aimed to ascertain the antimicrobial susceptibility profile and molecularly identify *A. baumannii* pathogens in Alex Ekwueme-Federal University Teaching Hospital, Abakaliki, Nigeria.

Methodology: A total of 385 clinical samples were collected aseptically from debilitated patients and analyzed following standard microbiological procedures. *Acinetobacter* species was confirmed by Gram staining reaction and biochemical tests. All bacterial isolates were phenotypically screened for multidrug resistance using the Kirby–Bauer disc diffusion technique and results interpreted as per CLSI criteria. *A. baumannii* isolates were finally confirmed using 16S rRNA sequencing.

Results: A total of 23(6%) *A. baumannii* isolates were recovered from 385 clinical samples collected from 87 patients comprising 48 males and 39 females admitted in various hospital wards

of AE-FETHA. The age of the patients varied from 20–79 years. The commonest sites for isolation of *A. baumannii* pathogen were catheter urine (8/8%) and wound sores (7/8%). The highest percentage resistance was observed with cefuroxime (96%), tetracycline (96%), sulfamethoxazole/trimethoprim (96 %), and ofloxacin (91%) while meropenem (91%) and imipenem (78%) were the most effective antibiotics against *A. baumannii*. The isolated *A. baumannii* was reconfirmed genotypically by 16S rRNA gene amplification. Variations were observed in the gene sequence of all the isolated *A. baumannii*.

Conclusion: Catheter urine, wound sores, and respiratory fluids were the more easily colonized samples. Also, high frequency of multidrug resistance observed in this study further established *A. baumannii* as a notorious opportunistic pathogen.

Keywords: *Acinetobacter baumannii*, antibiotic susceptibility profiles, 16S rRNA sequencing

Antioxidant Capacity and Antibacterial Activity of some Phyto-Spices against some Bacterial Isolates of Foods Origin

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Background: Due to continued burden of antimicrobial resistance by most of the bacteria of public health importance, research is being done to investigate the potency of phytomedicines to serve humanity. Spices that are mostly of plant origin are used in the preparation of almost all processed food to enhance palatability, tastiness, sweetness, and overall acceptability of that food, without taking into consideration of its medicinal values. In recent years, medicinal plants are used to develop new, effective, and safe antimicrobials that obstruct the burden of antimicrobials resistance. Many initiatives and programs have been set up by many health agencies with the aim of developing new, effective, and safe antimicrobials.

Methodology: The research was conducted to determine the antioxidant capacity and antibacterial activity of the extracts of *Allium sativum* (Garlic), *Syzygium aromaticum* (Clove), and *Zingiber officinale* (Ginger) against bacterial isolates of foods origin (*Bacillus cereus*, *Escherichia coli*, *Salmonella Typhi*, *Shigella dysenteriae*, and *Staphylococcus aureus*) using aqueous and ethanol extracts of the mentioned plants constituents. Bacterial isolates were collected from the microbial bank in the laboratory unit of the Department of Microbiology, Kano University of Science and Technology, Wudil. Gram staining and conventional biochemical tests were performed to re-confirm the purity of the isolates before the sensitivity tests. Antioxidant capacity was determined using 2,2-diphenylpicrylhydrazyl (DPPH) assay while agar disc diffusion techniques were used in the determination of the antibacterial activity.

Results: Both the two forms of extracts exhibited a strong antioxidants capacity at concentrations of 20, 40, 60, and 80 µg/ml that ranges from 89.5% to 97.5% for all the three plant extracts used.

Also, ethanol extracts were found to be more effective against all the bacterial isolates compared to aqueous extracts at $p \leq 0.05$ while *S. aureus* and *E. coli* were more sensitive to all the extracts compared to other isolates based on produces zones of inhibitions which ranges from 14mm to 28mm. The MIC's of the various ethanol extract ranged from 12 to 25 mg/ml and MBC ranged from 25 to 50 mg/ml.

Conclusion: The findings of this study show that these sources of spices possess potential antioxidant and antibacterial activity, with garlic being the most effective followed by clove and ginger. Hence, they have great medicinal impacts which if utilized, the burden of foodborne infection and poisoning may likely be halted with considerable measures in foods preservation practices. Also, isolates shows great variation in sensitivity to the studied extracts with *S. aureus* stood the most susceptible followed by *E. coli*, *B. cereus*, *S. Typhi* and *Shigella desentriae*.

Keywords: Antioxidant, antibacterial, cloves, garlic, ginger, and phyto-species

Antiplasmodial Activity of Aqueous Leaf Extract of *Dennettia tripetala* (Pepper fruit) in Albino Mice Infected with Chloroquine-Sensitive *Plasmodium berghei berghei* (NK65)

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Background: The search for new antimalarial drugs has become an urgent requirement due to resistance to available drugs and the lack of an effective vaccine. *Dennettia tripetala* is a medicinal plant used in many parts of Nigeria for the treatment of diseases.

Methodology: The antimalarial activity of *D. tripetala* against *Plasmodium berghei berghei* (NK65) infection in mice as an *in vivo* model was evaluated in this study. *Plasmodium berghei berghei* (NK65) was obtained from National Institute for Medical Research (NIRM), Lagos, Nigeria and maintained in the laboratory by serial passage in mice. Acute toxicity and antiplasmodial activities of *D. tripetala* were carried out using standard procedures. For acute toxicity, different concentrations of the extract (500, 1000, 1500 and 2000 mg/kg body weight) were administered to the mice divided into four groups of five mice each. Administration of extract was done orally with a canula attached to a graduated syringe. The mice were observed for 24 hours for signs of toxicity. Three different procedures - Chemosuppressive, prophylactic, and curative were used to evaluate the antiplasmodial potentials of the extract. Chemosuppressive measures the ability of the extract to suppress the infection rate of the parasite, prophylactic and curative effects measure the activities of the extract against early residual and established infections respectively. The experimental design comprised of Group 1 - not infected and received only food and water, Group 2 - infected and not treated, Group 3 - infected and treated with 5mg/kg chloroquine daily, and Groups 4 - 7 infected and treated with 500mg/kg, 1000mg/kg, 1500mg/kg, and 2000mg/kg body weight of *D. tripetala* respectively.

Results: The results showed that administration of up to 2000mg/kg of *D. tripetala* produced no overt signs of toxicity. Chemosuppressive results after 4 days of observation, showed that parasitemia suppression levels were 99.20% for Group 1, 96.89% for Group 3, 81.60% for Group 4, 77.62% for Group 5, 96.46% for Group 6, and 99.20% for Group 7 compared to the high level of parasitemia (37.67%) in the untreated mice (Group 2). Interestingly, *D. tripetala* exerted significant ($p < 0.05$) chemosuppressive activity in a dose-dependent manner. The results for prophylactic and curative tests showed a dose-dependent blood schizontocidal activity in all the phases of malarial infection studied. The *in vivo* antiplasmodial effect of the extract against *P. berghei* infection showed significant ($p < 0.05$) dose-dependent activity for prophylactic and curative tests. When the extract dose of 500mg/kg body weight was administered there was a significant decrease of about 12% in the parasitemia level when compared to the negative (untreated) group. There was also a significant decrease ($p < 0.05$) in parasitemia levels in the curative group, however, the last two days of extract administration showed stronger antiplasmodial curative activity.

Conclusion: It was therefore concluded that the extract possesses significant antimalarial potency which could be exploited in the formulation of antimalarial drugs

Keywords: Sickle cell, Anaemia, Antisickling

Application Areas of Optical Wireless Communication Technologies in 5G, 6G and Internet of things: Expectations, Directions and Threats

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Optical wireless communication (OWC) systems are indispensable in the actualization of the expected 5G, 6G wireless communication and internet of things systems. The significant issues in relation to quality of service of 5G and 6G systems are: high security, high quality of experience, low – energy consumption, low latency, massive connectivity. Obviously, 6G in comparison to 5G communication systems will offer better performance in regards to the stated performance metrics.

It is very important to emphasis that IoT (Internet of Things) based on internet data is an integral part of 5G and beyond this review paper is a presentation of how optical wireless technology such as: free space (FSO), infrared light(IR), light fidelity (LiFi), optical camera (OC) and visible light(VL) communications will be an effective solutions for successful deployment of 5GB systems with inherent threats of supporting the extensive varieties of heterogeneous traffic through designs and production of attocell in order to densify the network (i.e, to increase capacity of a network) for improved mobile performance and satisfying the mentioned quality of service-related performance metrics. Few areas of applications of optical wireless communication systems are: cellular connectivity support, space communications, vehicle-to-everything communications, underwater communications, smart shopping, electronic health (eHealth), and smart home etc.

The 5G communication has hit market in 2020, 6G network may be launched in between 2027 and 2030. Actualizing the design purpose of 5G, 6G and IoT (Internet of Things) may be challenging and required new spectrum to achieve. Hence, optical systems would play important roles in the actualization of emerging mobile technologies.

Keywords: Heterogeneous networks, IOT (Internet of Things), Attocell (i.e small optical cell)

Assessing the Quality of Palm Oil Derived from Different Local Processing Factories in Southeastern Nigeria

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Background: Different localities in Nigeria have their own unique way of processing the oil palm which most times has effects on the quality of the palm oil. It is crucial, to assess the qualities of oil gotten from different states in the eastern region from the local factories.

Methodology:

Sample collection: Palm oil samples were collected from four states; Abia, Anambra, Ebonyi and Enugu. Sample A (Enugu), B (Ebonyi), C (Abia) and D (Anambra). These samples were stored in a cool dry place for 10days before subjecting them to analysis.

Sample analysis: the collected samples were analysed for ester value, peroxide value, specific gravity, acid value, as well as saponification value. Determination of specific gravity carried out using Morris (1999) method. It was calculated as thus: weight of xml of oil/weight of xml of water. Determination of acid value was done using Akinola *et al* (2010) and Engoh, *et al.*, (2017) method. The acid value was deducted thus: 56.1VN/W.

Results: The ester value (190.69 ± 0.02^d), peroxide value (5.64 ± 0.01^d) and saponification value (192.29 ± 0.00^d) were significantly lowest ($P < 0.05$) in sample D when compared to other samples. The ester value (202.08 ± 0.00^a), peroxide value (10.73 ± 0.09^a) as well as saponification value (205.73 ± 0.02^a) were significantly highest ($P < 0.05$) in sample C. Sample C had the highest level ($P < 0.05$) of both acid value and free fatty acid levels (3.64 ± 0.03^a and 1.81 ± 0.01^a) among the treatment groups.

Conclusion: Since low level of fatty acids content in crude palm oil produces good physico-chemical properties of palm oil products that will be useful in industries and table purposes. Sample D therefore becomes the preferred choice from this study due to it better physio-chemical properties.

Keywords: oil palm, processing, value

Beyond COVID-19 Claims: Identifying Key Antiviral Phytomedicines in Africa Based on Evidence

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Background: The coronavirus disease 2019 (COVID-19) pandemic and its devastating impact appear to be the most dreadful global public health crises of the Common Era. Its level of negative impact experienced globally has not been recorded since World War II. Aside vaccines, there is no specific and globally authorized anti-viral drug, supplement or herbal remedy available for the treatment of this lethal disease except preventive measures, supportive care and non-specific treatment options adopted in different countries via divergent approaches to halt the pandemic. However, many of these interventions have been documented to show some level of success particularly the Traditional Chinese Medicines while there is paucity of well reported studies on the impact of the widely embraced Traditional African Medicines (TAM) adopted so far for the prevention, management and treatment of COVID 19 applicable to future viral disease threat.

Methodology: We carried out a detailed review of publicly available data, information and claims on the potentials of indigenous antiviral Plants used in TAM for the prevention and management of COVID 19.

Results: We have provided a holistic report on an evidence-based antiviral and/or anti-SARS-CoV-2 potentials of African plants based on in silico evidences, in vitro assays and in vivo experiments alongside the available data on their mechanistic pharmacology. In addition, we have unveiled knowledge gaps, provided an update on the effort of African Scientific community towards demystifying the dreadful SARS-CoV-2 micro-enemy and have documented popular anti-COVID-19 herbal claims used within the continent for the management of COVID-19 while the risk potentials of herb-drug interaction of antiviral phytomedicines when used in combination with orthodox drugs have been highlighted.

Conclusion: Africa is endowed with endemic antiviral plants suitable for development into effective and safe antiviral phytomedicines. Emphasis has been placed on herbal regulation and

standardization in Africa. Finally, the threat posed by the gradual loss of African flora as well as the need for a sustainable utilization of African plant biodiversity has been presented.

Keywords: African plant biodiversity, antiviral plants, Traditional African Medicine

Can *Annona muricata* Juice Serve as Complementary to ORS in the Dietary Management of Acute Watery Diarrhoea in Under Five Children?

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Background: The World Health Organization (WHO) defined diarrhoea as having three or more loose or liquid stools than normal for any individual. Acute Gastroenteritis (AGE, or acute watery diarrhoea) is the name given to diarrhoeal episodes in children. These account for approximately 1.34 million deaths annually in children younger than five years which is the study population. The aim of this study is to ascertain the effect of fresh *Annona muricata* (soursop) fruit juice on the gut microbiome as a dietary complement in the management of acute watery diarrhoea in Nigerian under-five children.

Methodology: A total of 24 stool samples comprising 12 each collected before and after 3-day administration of 90 ml each (10 ml X 3 daily per participant) of fresh *Annona muricata* fruit juice from 10 under-five children with AGE and 2 apparently healthy controls. These diarrhoeic stool samples were collected immediately after bowel movement with a swab stick and then inoculated into uBiome kits prior to 16S metagenomics analyses. The extracted bacterial DNA was sequenced for V4 region of the 16S rRNA using Illumina MiSeq platform. PICRUST was used to predict the metabolic functions from the 16SrRNA gene dataset. Analyses and comparison of the bacterial relative abundance and *in silico* predictions for bacterial metabolic functions from faecal samples in both pre- and post-administration of fresh *Annona muricata* fruit juice from test and control participants were undertaken.

Results: There was no significant difference in the alpha-indices typified by ACE, and Shannon index. The beta-diversity showed different clustering positions with principal coordinate analysis. However, at individual taxonomic categories, there was a marginal increase in some genera associated with gut health such as *Bifidobacteria*, *Faecalibacteria*, *Enterococcus* and an increase in *Firmicutes* and *Bacteroidetes* ratio. Some bacterial genera like *Clostridium* and *Bacteroides* associated with AGE were decreased in their relative abundance after administration of fresh *A. muricata* fruit juice. Downregulation of some bacterial metabolic functional genes associated with gut dysbiosis was observed from the faecal samples collected after consumption of the fresh juice. Some other bacterial functional genes like malate dehydrogenase, complex iron - sulphur molybdoenzyme family reductase subunit alpha, polypyrimidine tract - binding protein 2, and significantly xylan alpha-glucuronosyltransferase were upregulated. The gene ortholog, xylan alpha-glucuronosyltransferase was turned on in the subjects after the juice consumption. This may

influence the production of Short Chain Fatty Acids such as butyrate and propionate. Non - digestible dietary fibre derived from plant material is highly enriched in the lignocellulosic polysaccharides, cellulose and xylan. Genes encoding enzymes involved in xylan degradation have been identified previously in *Bacteroides* genera from human colon such as *Bacteroides ovatus* and *Bacteroides xylanisolvens* and some strains of *Bifidobacteria*. The fruit juice was generally well accepted by the under-five children with AGE and contributed to their better recovery outcomes.

Conclusion: Findings suggest that the fruit juice taken orally increases the relative abundance of some healthy bacterial gut flora and decreases those associated with gut dysbiosis in AGE. There was also putative regulation of genes for degradation of non - digestible fibres.

Keywords: *Annona muricata*, children, AGE

Can Specific Heat Capacity Explain Mechanism of Heat Sensation Due to Spicy Food substances?

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Background: Shift in body core temperature is an interesting phenomenon because of its clinical significance, and whose mechanism has been researched for centuries and is still active. Spices such as Pepper (Genus *Capsicum*) and Ginger can activate heat sensation when eaten. Capsaicin a compound found in most species of Pepper has been shown to activate warmth sensory neurons and produce heat from uncoupled ATP hydrolysis by Sarcoplasmic Reticulum Calcium Pump. The mechanism of how this manifest as temperature rise and other effects of capsaicin reported from the study of its thermoregulation such as desensitization of neural structures at high dosage have not been clearly understood. Our hypothesis is that specific heat capacity of body fluid is altered by some compounds in these species.

Methodology: This work considered the effect of some spices on the specific heat capacity of distilled water as a starting point because of water's role in thermoregulation in animals. Electrical method of determining heat capacity was used. The specific heat capacities of different solutions made from these spices using blending, maceration and decoction were determined.

Results: The results show that all the spices studied reduced the specific heat capacity of distilled water differently for all the three different methods of solution preparations.

Conclusion: In light of the result above, in the presence of these spices, less amount of heat energy will be required to raise the temperature of a Kilogram of the substance by 1°C compare to its pure form. Future research in collaboration with other specialist hopes to consider model of cell

fluid to understand how the specific heat capacity is altered by spices and the compounds responsible for the alterations.

Keywords: Body temperature rise, specific heat capacity, Spices, Capsaicin

Characterization of *Schistosoma* Eggs in a Putative Hybrid System in Ogun State

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Background: Schistosomiasis is a global health issue associated with water contact. Possible hybridization among the different *Schistosoma* species poses a risk to control and elimination targets. This is caused by the sharing of surface water resources by both humans and livestock for agricultural, domestic, cultural and recreational purposes in endemic communities. This study investigated possible occurrence of hybrid schistosomes using egg morphometric and molecular characterization in a putative hybrid zone in Ogun State, Nigeria.

Methodology: Urine samples from 384 human participants were screened for *Schistosoma* eggs in Imala-Odo, Abule-Titun, Apojula and Ibaro-Oyan in Ogun State using sedimentation method. Flotation method was used to screen faecal samples from 269 cattle for *Schistosoma* eggs. Recovered eggs were counted, photographed and measured with IC Measure™ for Total Length, Maximum Width and Length/Width ratio. Eighty-seven atypical-sized *Schistosoma* eggs were molecularly characterised by PCR amplification of *Schistosoma* specific Dra1 gene. Positive amplicons for the Dra1 gene were subjected to PCR amplification of an ITS-2 rDNA fragment of about 501 bp. Eight samples, representative of the study areas that had varying gel band sizes were sequenced. All quantitative data were analysed using descriptive statistics and Analysis of Variance (ANOVA). The significance level was set at p-value < 0.05.

Results: Schistosome eggs were recovered from 219 (57.0 %) of humans and 1 (0.4 %) of cattle. A total of 5,366 *Schistosoma* eggs were recovered from human urine, of which 1,984 were measured and analysed. A total of 154 (70.3%) of the infected persons had *Schistosoma* eggs with atypical measurements. The range for total length was 70.90 - 262.30 µm (mean 176.97±0.53µm) and width was 30.10 - 102.60 µm (mean 68.50±0.20µm) while length/width ratio was 1.60 - 4.06µm (mean 2.61±0.01µm). Egg morphotypes showed significant (p = 0.017) polymorphism; 67.8 % of the eggs had typical round-to-oval shape, 32.2 % were atypical spindle-shaped while 1.1 % (22) of the eggs were spineless. Scatterplots of egg morphometrics showed uneven distribution patterns among the *Schistosoma* eggs. PCR screening showed that 54 (62.1%) of the eggs screened were of *Schistosoma* origin respectively. DNA sequencing of eight samples identified the presence of vertebrate *S. magrebowiei* and Asian *S. japonicum*.

Conclusion: These findings suggest possible zoonotic hybrids of schistosome may be circulating in human population in the study area and this requires further diagnosis.

Keywords: Schistosomiasis, hybridization, control

Chitosan Based Nanoformulation as Edible Food Preservatives to Increase Shelf Life of Fruits: Current Perspectives, Challenges and Sustainable Outcomes

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Background: It has been estimated that at least 35% of fruits and vegetables produced in sub-Saharan Africa is lost between production consumption due to poor technology in the value chain. Nano formulation of thin films for coating edible fruits can improve the quality and storage shelf-life of fruits. These coatings are polymers used singly or in combination that prevents moisture and gases during processing, handling, and storage. Although chitosan-based films explored are promising, the knowledge gaps were identified and addressed from the current perspectives for edible coating.

Methodology: This paper presents the applicability, trends, and perception of chitosan as a viable, economical and eco-sustainable coating to improve food preservation. The details include the activity, mechanism of action, and their impact on food quality.

Results: The potential value of chitosan (pristine or composite) for fruit preservation is ascribed to the anti-oxidative properties. However, the challenge of moisture permeability and high solubility reduces its efficiency.

Conclusion: Therefore, the possible future trends in the modification of chitosan with polymer blends, plasticiser, and surfactant are discussed. Finally, chitosan-based edible coatings for food packaging not only improves the shelf life of food but are also essential by-product from for food processing that ensures sustainability, reduced food waste and improved food safety.

Keywords: Nano formulation, chitosan, food coating

Combating Climatic Flux of CO₂ using *Phoenix dactylifera* and *Mangifera indica* as a Clean Mechanism for CO₂ Sequestration and Reduction in Radioactivity Wave in Soil

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Background: The continual pile-up of CO₂ among other gases has geared hardship faced in many lands of the world. The resultant pile-up effect of CO₂ as bulk of the greenhouse gases has left wounded marks and is continually opening-up fresh wounds on humanity, with more than 75% possibility in a worst-case scenario been projected. From more than 80% increase in environmental problems in Asia, relating to deforestation to more than 50% increase-intensely in African painful experience in climatic impact, also with more than 48% loss in environmental functionality in Near East and North Africa which has alternated habitat, the impact of high-carbon-climate nexus keeps on ringing and stressing Humankind. This list is inexhaustive, presenting a view that if sustainable remediation is not taken then we will have more malnourished and sick people in years to come, our environment will be more polluted and toxic, our water system will become more and more difficult to remediate, there could be increase in local, national and international conflict among other unforeseen unpleasant happenings. To contribute as a modality towards solving this problem this study investigated, applied and used *Phoenix dactylifera* and *Mangifera indica* as a clean mechanism for CO₂ sequestration and reduction in radioactivity wave in soil.

Methodology: The study took place within the University of Abuja landmass. Random stratified experimental design was adopted where spatial and temporal data were collected on earth-system properties and the behavior of *Phoenix dactylifera* and *Mangifera indica* was studied in regards to its ability for CO₂ sequestration, where analysis and simulations were done. The area was model and interpolated to map sites of study and to find hot spots with grave threat in radiative wavelength emission. Explorative and descriptive statistics was applied in the study.

Results: Results indicated that *Phoenix dactylifera* and *Mangifera indica* is perfect and sustainable in CO₂ sequestration. The soils of the study area are compacted and has low, medium and some points of above-medium in its radioactive wave in soil, hence areas with above-medium in its radioactive wave flux where ranked unfit to support sustainable human-plant life and for the survival of the living entities within the soil system, with soil bulk density value range at 2.1gcm⁻³ – 2.71gcm⁻³. Organic carbon of the area was low.

Conclusion: Ecological tools like the use of *Phoenix dactylifera* and *Mangifera indica* was recommended for the study area environmental regeneration and for reduction in its radioactive wave flux.

Keywords: Piled-up CO₂; Clean mechanism; CO₂ sequestration

Comparative Evaluation of Molluscicidal Activities of Ethanolic Extract of *Alstonia congensis* and its Green-Synthesis Nanotized Derivative

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Background: Trematode-borne diseases pose significant health challenge globally. Control of snail hosts of infection is often challenged by the problem of toxicity of chemical molluscicides. Green-synthesized nanoparticles have been used to improve the efficacy of candidate drugs or bioactive agents and reduce toxicity at the same time. The aim of this study was to evaluate the efficacy of *Alstonia congensis* green-synthesized nanoparticle as molluscicide against snail hosts of trematodes.

Methodology: Leaves of *A. congensis* were air-dried, pulverized and extracted in absolute ethanol. The ethanolic extract was used for the formulation of nanoparticles using 10 mM silver nitrate. The molluscicidal activities of *A. congensis* leaf extract (ACE) and *A. congensis* silver nanoparticles (ACNPs) were tested on adult *Physa acuta* and *Bulinus forskalii* (n=5), and their eggs masses at varying concentrations. The adult snails were exposed to 4 mg/ml, 2 mg/ml, 1 mg/ml, and 0.5 mg/ml of ACE, and 0.25 mg/ml, 0.125 mg/ml, 0.0625 mg/ml and 0.03125 mg/ml of ACNPs. The egg masses of the two snails were also exposed for 6 days to different concentrations of ACE (4 – 0.5 mg/ml) and ACNPs (0.25 – 0.03125 mg/ml).

Results: The plant extract (ACE) did not show molluscicidal properties against adult *P. acuta* and *B. forskalii* at tested concentrations (4 – 0.5 mg/ml) compared to the negative control. The formulated ACNPs showed a very high molluscicidal activity against adult snails within 5 min of exposure. All exposed *P. acuta* and *B. forskalii* (100%) were observed dead in 0.25 mg/ml and 0.125 mg/ml of ACNPs within 10 min. The lethal concentration (LC₅₀) of ethanolic extract of *A. congensis* (ACE) against adult *B. forskalii* post-24 h exposure was 4.358 mg/ml. The LC₅₀ of the green-synthesized nanoparticles (ACNPs) tested against adult *P. acuta* and *B. forskalii* after 10 min of exposure were 0.0269 mg/ml and 0.073 mg/ml respectively. The plant extract (ACE) inhibited embryonic development within the egg masses of *B. forskalii* in all tested concentrations (4 – 0.5 mg/ml) but ovicidal activity was only observed in 4 mg/ml and 2 mg/ml of ACE in *P. acuta*. No development of embryos of *B. forskalii* and *P. acuta* beyond the blastula stage in all the tested concentrations of ACNPs.

Conclusion: The study showed impressive molluscicidal activities of green-synthesized *A. congensis* nanoparticles (ACNPs) against adult and embryos of *P. acuta* and *B. forskalii*. This has implication in the development of potent nanotechnological-based plant-derived molluscicide for the control of intermediate host trematode parasites.

Keywords: Green-synthesized nanoparticles, freshwater snails, trematodes control

Comparative Investigation of Some Molecular Biomarker Signatures of Weathered Crude Oils and Automotive Gas Oil

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Background: This research was designed to investigate some molecular biomarker signatures of weathered crude oils and automotive gas oil as a means of distinguishing them when there is oil spillage.

Methodology: Three samples of crude oil were collected from two producing field in the Niger Delta Nigeria and labelled OG7, OG8, AZU. A sample of automotive gas oil was collected from a dispensing station and labelled AGO. The samples were subject to a laboratory oil-weathering technique by rotary evaporation and thereafter to Gas Chromatography Mass Spectroscopy.

Results: The biomarker fingerprints of the acyclic isoprenoids and hopanes were used in calculating some diagnostic biomarker ratios such as Pr/Ph, CPI, $\% \sum(nC_{15} + C_{17} + C_{19})/\text{Total normal alkanes}$, $\sum(C_{21} - C_{31})/\sum(C_{15} - C_{20})$, Pr + nC₁₇, Ph + nC₁₈, Pr + nC₁₇/Ph + nC₁₈, C₂₉Ts/C₃₀-H, Ts/Ts + Tm, C₃₅HH/C₃₄HH, HHI, Moretane Index, Oleanane Index, C₃₁(S)/C₃₁(R), C₂₉ββ/(ββ + αα). Statistical plots such as the ternary plot, (nC₁₇ + nC₁₈)/Pr + Ph vs Pr + nC₁₇/Ph + nC₁₈ obtained from computed ratios gave a clear segregation of the samples. Similarly a dendrogram plot delineated samples UG7, UG8, AZU, and AGO but hit the crux by giving a 0.00% similarity between the crude oils and the AGO.

Conclusion: These ratios distinguished the samples in terms of the organic matter source, thermal maturity, redox environment degree of weathering and waxiness and gave a very clear distinction of the samples under investigation

Keywords: Biodegradation, Oxidic, biomarkers

Comparative Study of the Physico-mechanical Properties of Rice Husk and Saw Dust Particle Board Panel for Agro-waste control

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Background: Breast Cancer has always been a global challenge that is prevalent among women. There is a continuous increase in the high number of women mortality rates as a result of breast cancer and affecting countries at all levels of modernization. Women with high-risk factors including family history, obesity, and menopause have the possibility of developing breast cancer

cells. With the advent of radiotherapy, chemotherapy, hormone therapy, and surgery in the treatment of breast cancer, there have increased in the number of breast cancer survivors. Also, the design and development of drugs targeting therapeutic enzymes are helping to effectively treat the tumor cells at an early stage. However, long term use of anti-cancer drugs has been linked to severe side effects. This research aims to develop potential drug candidates that could serve as anti-cancer agents by utilizing phytochemicals from *M. oleifera*.

Methodology: Glide tool from Schrodinger molecular drug discovery suite (version 2017-1) was used in this research for protein and ligand preparation, receptor grid generation, and molecular docking. Also, SWISS ADME was used to compute the pharmacokinetic parameters, drug-like properties, and toxicity study of the phytochemicals from *M. oleifera*.

Results: In silico analysis of the bioactive agents from *M. oleifera* shows high binding affinity with the active site of BRCA1. Furthermore, there are favorable hydrogen-bonding interactions. Rutin, Vicenin-2, and Quercetin-3-O-glucoside have the highest binding energy of -7.522, -6.808, and -6.635kcal/mol respectively. The *M. oleifera* compounds demonstrate low toxicity and their drug-like properties predicted that they are promising hit drug candidates.

Conclusion: The binding affinity, protein-ligand interaction, and drug-like properties of compounds from *M. oleifera* confirm it has a high inhibitory effect against breast cancer. Thus, we proposed that *M. oleifera* may be a potential BRCA-1 inhibitor.

Keywords: *Moringa oleifera*, breast cancer, in silico

Comparative Study on Microbiological Quality Assessment of Indoor Air within some Selected Laboratories and Lecture Theaters in Bayero University, Kano

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Background: Assessment of microbial quality of indoor air is one of the most important parameters in environmental management. This study was aimed at assessing the microbiological quality of indoor air inside 25 laboratories and 16 lecture theaters within Bayero University, Kano (Old and New sites).

Methodology: Samples of air were randomly collected from both Old and New sites respectively. Observation schedule and questionnaires were used to assess sanitary conditions the sampling areas. Enumeration, isolation and identification of bacteria and fungi were carried out using settle plate technique. Meteorological parameters of the sampling sites were also recorded. An antimicrobial susceptibility test of bacterial and fungal isolates against some commercially available disinfectants was also carried out using disc diffusion assay.

Results: Results revealed that 52% of the respondents receive formal training on hand hygiene, 96% of the laboratories have offensive odor, 68% have cross ventilation, 100% of the laboratories floor is clean, and 80% have a working Fan/AC, while in the lecture theaters 56% of floor is clean, 100 of the lecture theaters has no offensive odors, 87% has working Fan/Ac, 81% have cross ventilation. Bacterial and fungal concentrations (CFU/m³) ranged from 0.45 x10³ to 5.35 x10³ and 0.84 x10³ to 5.33 x10³ respectively. Based on cultural, morphological and biochemical characteristics, 10 bacterial species and 13 fungal species were isolated and identified including *Staphylococcus aureus* 7 (19%), *Micrococcus luteus* 6 (17%), *Staphylococcus epidermidis* 5 (14%), *Bacillus subtilis* 4 (11%) while the predominant fungal species were *Aspergillus niger* 3 (16%), *Trichoderma* spp, *Fusarium* spp, *Rhizopus oryzae*, each had 2 (11%). Temperature in the laboratories ranged from 27 °C to 33.5 °C while in the lecture theaters ranged from 28.2 °C to 33.2°C. Carbon dioxide in the laboratories ranged from 92 ppm to 715 ppm while in the lecture theaters ranged from 405 ppm to 43 ppm. Relative Humidity in the laboratories ranged from 20 % to 38% while in the lecture theaters ranged from 17% to 38%. The susceptibility of disinfectant on bacterial isolate show that *Enterobacter aerogens* have the highest zone of inhibition of 17 mm on hypo and *Pseudomonas aeruginosa* have the lowest zone of 7mm while sensitivity to dettol show that *Staphylococcus epidermidis* and *Streptococcus pyogenes* have the highest zone of 15mm each and *Enterobacter aerogens* having the lowest zone of 10mm, both at 100% concentration, fresh lemon show no zone of inhibition to all the concentration. also sensitivity of disinfectant on fungal isolates show that *Aspergillus niger* have the highest zone of inhibition on Hypo and *Microsporium fulum* have the lowest zone of 9mm. also sensitivity to dettol show that *Fusarium* spp have the highest zone of 18mm while *Aspergillus lentulus* and *Rhizopus oryzae* have the lowest zone of 12mm both at 100%. Susceptibility to Hypo and Dettol was appreciable; they were bacteriostatic at 50-100% concentrations (MIC) and bactericidal at mostly 100% concentration. 'Fresh Lemon' was less effective and was bacteriostatic to only two isolates at 50 and 100% concentrations but not bactericidal. Hypo had an MIC of 100% concentration against most isolates and MFC of 100% concentration against *Absida corymbifera* only.

Conclusion: Problems of indoor air pollution are recognized as important risk factors for human health in both low-income and middle- and high-income countries. Indoor air is also important because populations spend a substantial fraction of time within buildings. Sanitary condition need to be improved in laboratories and lecture theaters, basic training and education should be given to lecture theaters cleaners so that the environmental hygiene will improve. The indoor air quality of some lecture theaters was found to be poor with the levels of airborne bacteria and fungi exhibiting levels higher than the prescribed limits. Meteorological parameters were observed to have varying degree of effects on bacterial and fungal concentration.

Keywords: Microbiological, Indoor air, Quality

Composite Cassava-Wheat Flours: Proximate and Pasting Properties of Composite Flours Produced with Low Postharvest Physiological Deterioration Cassava as Affected by Variety

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Background: Proximate and pasting properties of composite flours are crucial properties determining the nutritional and functionality of starchy food ingredients in baking and extrusion processes. This study investigated varietal differences on the proximate and pasting properties of composite cassava-wheat flours produced with blend of wheat and low or delayed postharvest physiological deterioration (PPD) cassava flours.

Methodology: Wholesome four varieties of yellow-fleshed Low PPD cassava and one variety of high PPD cassava were, peeled, washed, grated, pressed, pulverized, flash dried at 120 °C for 8 minutes, milled with cyclone hammer mill fitted with a screen of 250 µm aperture size, cooled and packed into high density polyethylene bag. The cassava flours were composited with wheat flour and analyzed for proximate and pasting properties. Data obtained were subjected to analysis of variance (ANOVA) using SPSS 25.0 and significant means were separated applying Duncan multiple range test.

Results: Moisture, protein, fat, ash, sugar, starch dry matter and energy value ranged from 12.45±0.07 - 13.10±0.00 %, 10.30±0.00 - 11.65±0.07 %, 0.40±0.50 - 3.71±0.28 %, 0.58±0.00 - 0.62±0.01 %, 1.75±0.00 - 2.08±0.06 %, 70.94±0.34 - 74.40±0.57 %, 86.90±0.00 - 87.55±0.07 % and 1464.29±2.23 - 1531.66±1.41 KJ/kg, respectively. Peak, trough, breakdown, final, setback, peak time and pasting temperature ranged from 180.63±0.54 - 247.21±1.12 RVU, 95.84±2.77 - 129.00±1.65 RVU, 83.42±0.83 - 118.21±0.53 RVU, 139.29±3.02 - 253.71±1.48 RVU, 83.79±1.12 - 124.71±1.82 RVU, 5.90±0.42 - 6.17±0.05 min and 69.00±0.59 - 73.48±0.04 °C, respectively.

Conclusion: Considering the dry matter content, energy value, peak viscosity, low breakdown viscosity and pasting time, composite flours C-C1368-W and C-C0593-W prepared with flours from IITA-TMS-IBA-011368 and IITA-TMS-IBA-070593 clones could find application in baking industry.

Keywords: Composite cassava-wheat flour, pasting properties, postharvest physiological deterioration

Composting of Sawdust Enriched with Cow Dung for Biofertilizer Synthesis

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Background: With the increasing demand in agricultural produce, it has become important to increase productivity by using various fertilizers. The aim of this study is to produce biofertilizer using saw dust enriched with cow dung.

Methodology: Biofertilizer was produced in this research by composting mixtures of sawdust and cow dung. The sawdust was collected from saw mill Na'ibawa yankatako Market which serve as carbonaceous, while the cow dung was purchased from Abattoir Fagge-Kano which serves as nitrogenous source. The mixtures of organic waste were composted at the weight ratio (2:1) and CN ratio of (29.17). The rapid composting method was adopted. The study was carried out at Bayero University Kano. Six pits of (1.8x1.2x0.9) were excavated at ecological garden for field composting. The composition and treatment were Sawdust plus cow dung with aeration (SCE), sawdust plus cow dung without aeration (SCN) and sawdust used as control. Turning over was done once every week for aeration. Temperature was monitored at different depths daily. The compost pile lasted for 60 days while a sample from the pits was taken after every 10 days for laboratory analysis, Microbiological and other physicochemical parameters such as N, C, K, P, Mg, pH, ash content, moisture content and heavy metals were determined at the end of the composting.

Results: The results of the study showed that a mixture of sawdust and cow dung with aeration gave a higher percentage of Nitrogen while carbon decreased due to increase in the temperature. Highest temperature obtained was 60.5°C for SCE 49°C SCN and 26°C for SC due to lack of nitrogenous source. Also the temperature of some of the compost decreased slightly at day 32 due to maturity of the compost. The heavy metal content of all the composts decreased to World Health Organisation acceptable standards established by United States Environmental Protection Agency (2004). Decrease in microbial count was also observed for both bacteria and fungi with increased in maturation phase from initial zero day to completion of process at 60 days of composting. Furthermore, a total of eight bacteria and five fungi were isolated from the three pits compost sample sites. From these, two most efficient bacterial and fungi isolates were identified throughout the compost period are *Bacillus species* and *Aspegillus spp* based on their ability to adapt to the moderately high temperature of the compost, the plant growth activity of biofertilizer on *Vigna unguiculata* (beans) which is significantly greater ($p > 0.05$), the C:N ratio also dropped to 12%, which indicate the compost maturity.

Conclusion: It can be concluded from this research that production of high quality biofertilizer can be achieved by the composting of sawdust with use of appropriate nitrogen amendments bulking agent. The compost characteristics indicate that it was mature.

Keywords: Environment, waste management control

Design and Fabrication of Composite Biomimetic Scaffolds Impregnated with *Chromolaena odorata* Methanolic Extract for Promoting Diabetic Wound Healing

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Background: Diabetic wounds are difficult to heal partly due to their exposure to infectious materials from microorganisms in the environment. A responsive wound dressing is vital to wound healing, and to protect diabetic wounds from external damages, composite biomimetic scaffolds were designed, fabricated, and impregnated with methanolic extract of *Chromolaena odorata* to promote diabetic wound healing.

Methodology: Double-layer scaffolds were synthesized by casting method using rational amounts of highly supportive biopolymers – chitosan and calcium silicate, and loaded with graded quantities of methanolic extract of *Chromolaena odorata* (L.) R.M. King & H. Rob, a shrub reputedly used in folkloric medicine for wound healing. Scaffolds were tested in terms of morphology, encapsulation efficiency, pore size and porosity, water absorption and retention capacities, pH-dependent swelling ratios, differential scanning calorimetry (DSC), fourier-transform infrared spectroscopy (FTIR), and anti-microbial activities. Biological tests including percentage in vitro haemocompatibility, wound healing in alloxanized diabetic rats, and histopathological features were further evaluated.

Results: The scaffolds had porous interconnected structure and good encapsulation efficiency ranging from 65.2 – 91.5 %. The scaffolds had high water absorption capacity and swellability above 100 %, and good water retention capacity. Swelling ratios of the scaffolds were high in both acidic and neutral pH conditions, and they had good porosities and pore sizes. The functional groups highlighted in the FTIR results indicated good compatibility between the starting polymers and the extract. DSC result showed the scaffolds had low crystallinity and potential amorphicity with broad-spectrum antimicrobial property. Scaffolds had acceptable haemocompatibility, and after 21 days of wound dressing, extract-loaded scaffolds resolved diabetic wounds faster in study animals than the unloaded scaffold. This effect was comparable with the commercial wound dressing patch. Histopathological analysis revealed normal epidermal structure produced by drug-loaded scaffolds compared unloaded group.

Conclusion: The results provided evidence of the wound healing property of *C. odorata* and suggested that *C. odorata* extract-loaded composite bioscaffolds is a potential candidate for skin regeneration

Keywords: Scaffold, *Chromolaena odorata*, Wound

Development of Plastic Waste Stabilized Earth-Based for Building Materials: an Approach for Eco-friendly and Sustainable Construction Materials

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Background: Cement is the most used conventional materials in the construction field. But its production and utilization are energy consuming, linked with raw material depletion and CO₂ emission. The global CO₂ emission generated by the utilization of cement was estimated to more than 10% and estimated to increase in the next decades. Therefore, in the construction field research are directed towards the development of new construction materials that are eco-friendly, require less energy for production and during service life, sustainable, locally available and cost friendly. In that direction, earth-based materials constitute the best alternatives for cement. However, their low strength and durability constitutes a major drawback for their utilization in the construction field. Henceforth, plastics waste reinforcement in construction represents a solution for strengthening the earthen matrix and the plastic waste management.

Polymers in the form of plastics are non-biodegradable materials and most used materials in households for multipurpose (from food packaging to construction materials). From their non-biodegradable nature, the polymer constitutes a hazardous factor to the environment and the communities due to its improper disposal. There are a lot of alternatives for plastic waste management; nevertheless these processes are not sufficient to manage the amount of plastics waste produce in the communities. Therefore, the plastics wastes are generally landfilled or burnt generating the releases of some gases harmful to the ecosystem causing environmental instability.

Methodology: The plastics waste was powdered and used to stabilize the soil at different level. The specimens were mold prior to mechanical, morphological and chemical composition testing. The specimens were left at room temperature for the curing period.

Compressive strength testing was performed on the samples at 7 and 90 days.

The mechanically tested specimens at 90 days were used for the morphological, chemical composition and functional group characterization through Scanning Electron Microscope (SEM), energy-dispersive X-ray spectroscopy (EDX) and Fourier Transform Infra-Red (FTIR) respectively.

Results: The mechanical performance of the specimens increased with the addition of plastics waste stabilizations level. That is explained by the interaction taking place within the bio-composite (soil and plastic-waste stabilizer).

The morphological and chemical component displayed a significant variation in the surface texture and the chemical composition content.

Conclusion: The addition of plastics waste increased the mechanical performance of the specimens. The utilization of plastics waste as stabilisers will reduce the amount of plastics waste to be burnt or landfilled. Henceforth environment stability will be established over the next decades. The plastics waste will add value as they will be used as a construction material.

Keywords: plastic waste, earth-based matrix, eco-friendly building materials

Diagnostic Reference Levels (DRLs) and Image Quality Evaluation for Digital Mammography in a Nigerian Facility

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Background: DRLs for digital mammography and image quality evaluation are important optimization tools in medical imaging. High quality mammograms are essential to the successful early detection of breast cancer. The objective of the study was to establish DRLs for digital mammography and to assess image quality of the mammograms for optimization.

Methodology: DRLs was established using thermoluminescent dosimeter (TLD) chips to estimate the mean glandular dose for both cranio-caudal and medio-lateral oblique projections. The TLD chips were calibrated at the National institute of radiation protection and research (NIRPR), Ibadan, Nigeria and read at the department of Physics and Physics engineering, Obafemi Awolowo University, Ile- Ife. The DRLs were set at the 75th percentile of the distribution of the median value of mean glandular dose. Image quality was assessed using European Commission guideline for mammographic image quality assessment.

Results: DRLs were 0.53mGy for cranio-caudal and also 0.53mGy for medio-lateral oblique. Image quality evaluation showed criteria scores for cranio-caudal and medio-lateral oblique projections as 76% and 61.2% respectively. The mammograms scored the highest and lowest score of 100% and 44% on criteria 2 (as much as possible of the lateral aspect of the breast is shown) and criteria 6 (absence of skin fold) respectively for cranio-caudal projections while for the mediolateral oblique projections, criteria 1 (all breast tissue clearly shown) and criteria 5 (inframammary angle clearly demonstrated) have the highest and lowest score of 96% and 8% respectively.

Conclusion: DRLs for digital mammography and image quality evaluation are important optimization tool that should be adopted by every radiology department with mammography unit. These tools ensure that the images obtained meet the clinical need of the patients and the radiation used for the examination is adequate. There is also the need for continuous education and training of personnel.

Keywords: Diagnostic reference level, mean glandular dose, image quality evaluation

DNA Barcode Authentication of Four Woody species of Fabaceae from Mbe Mountain and Community Wildlife Sanctuary, Cross River State, Nigeria

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Background: Mbe Mountain and Community Wildlife Sanctuary (MMCWS) in Cross River State, Nigeria is rich with biodiversity, which includes a large number of endemic, rare and threatened plant species. Previous studies have used DNA barcoding to inventory species for applications in biodiversity monitoring, conservation impact assessment, monitoring of illegal trading, authentication of traded medicinal plants etc. This is the first Montane forest barcode study in Nigeria and the first attempt to assemble a reference barcode library for the trees of MMCWS as part of a larger project to inventoried the entire flora of Cross River State.

Methodology: We sampled four (4) woody species of Fabaceae family in MMCS. Total genomic DNA was extracted from fresh-leaf of the specimen, amplified and sequenced at *matK* region using universal primer set. The amplicons' bidirectional sequencing was carried using standard procedure. The obtained sequences were edited and aligned appropriately to identify parsimonial informative sites. The obtained barcodes were used to identify the study species using BLAST for highly similar barcodes from NCBI and supplemented by the phylogenetic tree and evolutionary distance analysis to establish the taxonomic identities of the study specimens. The physic-chemical property of their protein sequences was determined using the Swiss proteomic server prozram PROIPARAM and the Guarime Cytosine content was estimated using the interactive online program GENSCAN. The secondary protein structure was determined using the online interactive program N-SOPMA; while phyre and phyre was used for the determination of the tertiary protein folding structures.

Results: The result revealed the identity of the four woody species as *Aganope stublmannii*, *Amphimas ferrugineus*, *Cylicodiscus gabunensis* and *Hylodendron gabunense* with 97.92, 98.89, 99.25 and 99.03 percent homologies respectively. The evolutionary distances between pair of the species ranged between 4.63 % and 13.67 %. Our results on physicochemical properties of amino acid showed that the higher the number of amino acids residues, the weightier; higher positively and negatively charges the greater the number of atoms as well as extinction coefficient. Similarly, the proteins of *A. stublmannii* and *C. gabunensis* were less thermally stable and have more flexible protein structure than those of *H. gabunense* and *A. ferrugineus*. Similarly, proteins of *C. gabunensis* and *H. gabunense* are hydrophobic in nature while those of *A. stublmannii* and *A. ferrugineus* are hydrophilic. The domain architecture of proteins from *A. stublmannii*, *A. ferrugineus* and *C. gabunensis* revealed that they are dominated by alpha helices and random coil while *H. gabunense* by extended strand.

Conclusion: Thus, using DNA barcodes primers systems is reliable, fast and cheap system for species identification in Montane flora. The identified plants also have medicinal properties,

hence, the generated barcodes could be used to monitor unsustainable and indiscriminate collection of plants from the MMCWS reference barcode library for their medicinal value.

Keywords: DNA Barcode, Authentication, Mbe Mountain

Dose Optimization for Common Computed Tomography Examinations in Enugu Metropolis, Nigeria using Clinical Indication Based Diagnostic Reference Levels (DRL_{CIB})

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Background: The clinical application of computed tomography (CT) in diagnostic imaging has markedly increased over the recent years with associated concerns about the radiation risks to the patient. There is need to obtain good diagnostic quality images at the lowest possible radiation dose. The study objectives were to establish DRLs for adult Computed Tomography (CT) common examination based on Clinical indications and assess diagnostic CT image quality obtained after optimization.

Methodology: This cross sectional study was conducted at the CT unit of 5 hospitals/diagnostic centres in Enugu with CT facility. A total of 2490 subjects were selected using convenient sampling method with the distribution: 1200 brain scans (48.2%), 420 chest scans (16.9%) and 870 abdominal scans (34.9%) with different common clinical indications for the pre-optimization phase. Optimization process was conducted to determine the minimum radiation dose required to produce good diagnostic images. In the post-optimization phase, a total of 205 subjects were studied comprising of 5 patients each per clinical indication and centre of study. The median values and percentiles of computed tomography dose index (CTDI_{vol}) and dose length product (DLP) for head, chest and abdomen/pelvic CT examinations of different clinical indications was calculated using descriptive statistics. Student t-test was used to make comparison between the measured doses and reported data from previous literatures. The consistency of subjective evaluation of image quality by 3 experienced radiologists and the objective image quality assessment using signal to noise ratio (SNR) analysis were performed with the Kendall coefficient of concordance (W) and ImageJ software v.2.10 (National Institute of Health, USA) respectively ($p < 0.05$).

Results: The clinical diagnostic reference levels (CTDI/DLP) for head were 43/907, 43/879, 43/1689, 34/969, and 28/995 for trauma, CVA, metastasis, infection and seizure respectively, while that of the abdomen/pelvis were 16/2723, 12/2011, 16/2011, and 15/2047 for liver disease, malignancy, mass and urography respectively. The clinical diagnostic reference levels for chest (CTDI/DLP) were 13/763 and 13/1531 for lung disease and mass respectively. Qualitative and

quantitative assessment of image quality showed that all the post-optimization images were rated acceptable and showed high SNR values. The SNR value range of $15.3 - 16.5 \pm 1.6$, $20.7 - 20.9 \pm 1.3$ and $14.3 - 15.4 \pm 1.6$ was obtained for brain, chest and abdomen/pelvis respectively. There was dose reduction of 7%-66% for CTDI value and 4%-68% for DLP values in the post optimization phase. Statistically significant difference in DRL values was noted within and between CT technologies ($p = 0.031$ and 0.026 respectively).

Conclusion: There is need to optimize current CT protocols in Enugu as higher CTDI and DLP values were obtained when compared to other national and international studies especially in the chest and abdomen/pelvis region. The image qualities pre- and post-optimization were comparable with associated reduction in patient radiation dose.

Keywords: CT Dose Optimization; Clinical Indication Based; Diagnostic Reference levels

Effect of Alpha Spin Nanoparticles on the Molecular Status of Acha (*Digitaria exilis* Kippis Staph)

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Background Alpha-Spin works by optimizing the natural frequency, stimulating vital life energy, and increasing harmony in the body, and can be used to improve plant growth, seed germination, and extend the shelf life of fruits and vegetables.

Methodology Eight Acha accessions namely, Loma, Jakashak, Ndai, Egyong, Nding, Napiya, Tishi and Namuruk were exposed to four time regime treatments from an Alpha-Spin® Nano-plate of fifteen, thirty, forty five and sixty minutes. The treatments with the untreated control of zero minutes were laid out in a randomized complete block design (RCBD) using three replications.

Results Molecular characterization results revealed a high homology between the sequences of the accessions treated with the query sequence. Physicochemical properties of the proteins like number of amino acids, molecular weight, theoretical isoelectric point, extinction coefficient, total number of positive and negative residues, instability index, aliphatic index and grand average hydropathy all showed similar pattern of response to the nanoparticles treatment. Amino acids composition of the proteins revealed that, most accessions were richer in leucine under the various treatments. The phylogenetic relationship showed that, clustering was mostly based on response to the treatment rather than on accession type

Conclusion The study has confirmed that the nanoparticles exerted an effect on the molecular status of Acha (Fonio) and has created additional variability which can be used for the purpose of breeding and selection of the crop.

Keywords: Alpha spin nanoparticiles, Acha (Fonio), Variability

Effect of Roselle (*Hibiscus sabdarifa*) based Biolubricant on the Performance and Exhaust Emission on Spark Ignition Engine

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Background: Over the years, the growing interest for bio-based alternatives to mineral products (i.e. fuel and lubricant) to save energy and improve environmental friendliness is one of the most researched topics. The world relies heavily on petroleum-based products in transportation and industrial sectors, which may cause grave concern related to future energy security. This paved the way for environmentally friendly lubricants derived from alternative sources.

Methodology: Roselle is an edible and biodegradable oil. The extracted Roselle oil was purified, degummed and epoxidized to form biolubricant. The sample was analyzed using Gas Chromatography-Mass Spectroscopy (GC-MS) and Fourier Transformation Infrared Spectroscopy (FTIR) and also, the physicochemical properties were determined.

Results: Engine performance and gas emission on the Roselle biolubricant and standard lubricant was carried out on stationary spark ignition engine. The engine speed and the torque were varied as 2000rpm, 2500rpm and 3000rpm and 2Nm, 3Nm and 6Nm respectively. It was found that in comparison to fossil lubricants, there was no much difference in CO emission at 2000rpm with 1%, -8%, and 3% volume increase for 2Nm, 4Nm and 6Nm respectively for the biolubricant. The trend was similar for the 2500rpm and 3000rpm. Moreover, CO₂ and HC emission depicts similar trend with CO emission for the varied parameters. For the engine performance, the Brake power (BP), Brake thermal efficiency (BTE), and Brake specific fuel consumption (BSFC) for the varying parameters were studied. The average BP for the three speeds was calculated for fossil lube as 545W, 610W and 790W for 2Nm, 4Nm and 6Nm respectively. Roselle lube depicted an average BP of 380W, 500W and 580W for 2Nm, 4Nm and 6Nm torque respectively. The trend is similar for the other two engine parameters studied.

Conclusion: This research affirmed that Roselle seed oil was effective in production of biolubricant with good properties, emission and performance characteristics.

Keywords: Roselle Lubricant; Exhaust emission; Engine performance

Effect of Snail Mucin (*A. marginata*) on Cardiac Function of Common Toads

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Background: Cardiovascular disease (CD) is increasing globally and has been associated with many side effects that cause morbidity and mortality in vertebrate. Mucin of *Archachatina marginata* was reported to contain biological properties that could prevent CD. The effects of mucin on cardiac functions have not yet been fully explored.

Methodology: Two hundred and forty (240) Snails were purchased from Department of Forestry and Wildlife Management, Federal University of Agriculture, Abeokuta, with an average weight of 180.6 g. Mucin was extracted with chilled acetone and distilled water, twenty adult (20) toads with mean body weight (102 g) were obtained from swampy areas in Osiele and Obantoko, grouped into four with two replicate each, containing five toads each. Toad hearts were prepared in-situ and the ventricles were connected to the clip of the electronic kymograph at a speed of 2.5 mm/seconds. The toads were injected with 0.3 ml concentration of the treatment mucin, at the hind limb muscle and monitored for 5 minute to ascertain uniform circulation of blood. The heart rate (HR) and heart contractility (HC) were observed after administering each treatment and compared with their baseline value (control).

Results: At all-time intervals recorded, there were significant changes in the heart contractility and the heart rate after infusion of mucin. Mucin of *A. marginata* species reduced heart contractility and heart rate of the toads when compare to the control.

Conclusion: Mucin showed a potential to decrease heart rate and heart contractility thereby enhancing cardiac function in adult common toads.

Keywords: Mucin, Toad, Kymograph

Effects of Electronic Gadgets on Testosterone Production in Young Males of Enugu Metropolis

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Background: A healthy adult male's serum testosterone level varies between 2.5-10ng/dl. Contributors to this variation are numerous lifestyle factors and circadian rhythm. Testosterone levels below the lower range are usually associated with infertility. Due to certain changes in general lifestyle, rate of infertility among males has reportedly increased in recent years. Hence, this research evaluated the effect of electronic gadgets on Testosterone production in young males of Enugu Metropolis.

Methodology: A total of seventy-seven (75) males aged 18-39 years were involved in this cross sectional study, about 53 males (high frequency electronic gadgets users) were used as test subjects and 22 males (low frequency electronic gadgets users) as control subjects. We excluded males whose lifestyle and health conditions were known to have added effects on testosterone production and circulation. Research questionnaires were presented to the respondents to ascertain certain personal information. Our control group consists of respondents with confirmed low (less than 2hrs cumulative) daily electronics gadget usage (LFU); the test group consists of respondents with confirmed high (over 5hrs cumulative) daily electronic gadget usage (HFU) and electronics gadget repair professionals (ERP). Anthropometric indices were measured and recorded. Five milliliters of blood samples of respondents were collected for serum testosterone

determination using ELISA method. All data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22-computer software at 95% confidence level. Ethical approval was obtained from University of Nigeria Teaching Hospital Enugu before commencement of study.

Results: A comparison of the mean \pm SD of High and low Frequency electronic gadget users showed significantly ($P < 0.05$) higher values of systolic blood pressure (SBP) (109.78 ± 12.53 , 107.77 ± 8.1) and testosterone level (5.3 ± 2.1 , 2.93 ± 0.8) respectively.

Conclusion: This study surprisingly demonstrated a positive effect of exposure to electromagnetic frequency radiation from electronic gadgets on testosterone levels of the respondents.

Keywords: Testosterone, Electronic gadgets, Systolic blood pressure

Ethnobotany of Medicinal Plants used for the Prevention of COVID-19 Symptoms by Egun People in Badagry, Lagos State, Nigeria

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The objective of this study was to establish a regional profile of the indigenous knowledge system (IKS) for medicinal plants used for the prevention of various COVID-19 symptoms in Badagry area of Lagos State, Nigeria. An ethnobotanical survey was undertaken to collect information from herb sellers, traditional healers and other people from different walks of life that gave their consent in granting the interviews in the study area between July and October 2020. Fifty (50) medicinal plant species that belong to 20 families were identified as being used for the treatment of various COVID 19 related symptoms with the highest number of species being used for fever and malaria followed by dry cough and body pains. Trees (18 species) were found to be the most used plants followed by herbs (15 species), shrubs (10 species) and climbers (7 species). High informant consensus factor values were obtained for *Azadirachta indica*, *Allium sativum*, *Zingiber officinale* and *Garcinia cola*, which were reported to treat fever, sore throat, dry cough and boost immune system respectively. The traditional healers and herb sellers in Badagry area possess rich ethno-pharmacological knowledge. This study identified and documented many indigenous medicinal plants that can serve as precursors to manufacturing of drugs thus, indicating high potential for economic development.

Keywords: COVID-19 symptoms; Medicinal plants; Egun people

Evaluation of Anti-depressant Properties of Ethanol Extract of *Zingiber officinale* Rhizome in Mice

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Background: Depression, a common psychiatric disease, is associated with moodiness, disinterest, and anhedonia. It has assumed a global health concern status as it affects up to 20% of the world's population. *Zingiber officinale* is a traditional herb used to treat various disorders. This study evaluated the effect of ethanol extract of *Zingiber officinale* (EEZO) rhizome on depression in mice.

Methodology: Forty-eight male mice (28 ± 2 g) were used and divided into six groups of 8 mice each. Depression was induced using the chronic mild stress model and then treated for three days afterwards. Group 1: control (normal saline), group 2: depressed, group 3: standard drug (diazepam; 1 mg/kg), groups 4, 5 and 6: treatment (50 mg/kg, 100 mg/kg and 200 mg/kg) body weight of EEZO respectively. Behavioural tests (open field, tail suspension, sucrose preference, dark and light box, hole maze and object exploration) were carried out on the mice before and after treatment. Concentration of inflammatory cytokines such as prostaglandins E₂, interleukin-1, tumour necrosis factor- α , interferon gamma, cyclooxygenase and nitric oxide was determined.

Results: The extract significantly ($p < 0.05$) improved behavioural pattern of mice and reduced the level of the inflammatory biomarkers, relative to the depressed mice.

Conclusion: The results implied that EEZO reduced stress-induced depression in mice and could be a potential alternative for anti-depressant drug formulation.

Keywords: Depression, Chronic mild stress model, *Zingiber officinale*

Evaluation of Antiplasmodial, Cytotoxic, Antioxidant and Inhibition of Parasite Haem Polymerisation Activities by Medicinal Phytochemicals of *Nuclea latifolia*

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In spite of the dedicated struggle to eliminate malaria, the current trend of the infection, particularly, in sub-Saharan Africa still remain worrisome due to failing control and treatment approaches caused by myriad of factors. Therefore, the search for new, affordable and more potent antimalaria drugs from plants especially has become frontline in recent times. This study thus, evaluates the *in vitro* antiplasmodial, cytotoxic, antioxidant and inhibition of parasite haem polymerization activities of the phytochemical (alkaloids, flavonoids, tannins, saponins, cardiac glycosides and anthraquinones) extracts of *Nuclea latifolia* using documented methods. Results show that the alkaloid extract was non-cytotoxic ($CC_{50} = 69.18 \mu\text{g/ml}$) and most selectable ($SI = 125.5$) with the highest antiplasmodial ($IC_{50} = 0.95 \mu\text{g/ml}$) and haem polymerization inhibition ($IC_{50} = 0.83 \mu\text{g/ml}$) activities, but moderate antioxidant (free radical scavenging, FRS; $IC_{50} = 0.14 \mu\text{g/ml}$, lipid peroxidation inhibition, LPI; $IC_{50} = 575.44 \mu\text{g/ml}$) capacity. Alkaloid is the active antiplasmodial phytochemical of *N. latifolia* and one of its mechanisms of action is by inhibiting parasite haem detoxification. However, the outcome of complementing the alkaloid's moderate antioxidant activity with the flavonoid extract that possessed the highest antioxidant (FRS; $IC_{50} = 0.13 \mu\text{g/ml}$ and LPI; $IC_{50} = 501.19 \mu\text{g/ml}$) capacity should be explored. This study warrants the identification of *N. latifolia* alkaloid and flavonoid compounds for further investigation.

Keywords: *Nuclea latifolia*, Malaria, Alkaloid, Haem polymerization

**Evaluation of *Chromolaena odorata* as Growth Promoter in the African Catfish
(*Clarias gariepinus*, Burchell 1822)**

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Background: *Chromolaena odorata* (L.) R.M. King & H. Rob. (Asteraceae) is a perennial herb, invasive in Nigeria, and it has been reported severally for its therapeutic potentials and nutritional values in livestock however not in aquaculture. It is used in traditional medicine since ancient time. The effect of different concentrations of *Chromolaena odorata* (Siam weed) supplement in fish diet on growth parameters of *Clarias gariepinus* fingerlings was investigated.

Methodology: One hundred and forty four (144) mixed sex African Catfish fingerlings (*Clarias gariepinus*) of an average body weight of 1.10 ± 0.01 g and average length 4.85 ± 0.04 cm were randomly allotted into four experimental groups of 0% (controls), 0.5%, 1.0% and 3% concentrations of *Chromolaena odorata* in diet and fed at 5% body weight per day for a period of 70 days.

Results: *Chromolaena odorata* supplemented diet did not have any significant effect on weight gain of *Chromolaena gariepinus* when compared to fish in the control diet. However, final fish weight was significantly ($P < 0.05$) higher than the initial fish weight in all concentrations of *Chromolaena odorata* in fish diet and in the controls. The total length were marginally ($P > 0.05$) difference in fish fed different concentrations of *Chromolaena odorata* at the end of 70 days. However, increase in total length was observed in fish fed with *Chromolaena odorata* supplemented diet over fish in the control diet. The best growth responses were obtained in the fish fed on diet containing 1.0% *Chromolaena odorata* (2.39 ± 0.041 g) while the slowest growth was obtained in the fish fed on the control diet (1.91 ± 0.127 g). The best feed conversion ratio (FCR), specific growth rate (SGR) and condition factor (K) were observed in fish fed on diet containing 1.0% *Chromolaena odorata* compared with control.

Conclusion: This study had shown that *Chromolaena odorata*, could be fed as additives in African catfish culturing at low doses (0.5-3.0%) without causing negative growth and that 1.0% *Chromolaena odorata* supplement in fish feeds elicited more increase in fish total length and growth weight parameters of *C. gariepinus*. *Chromolaena odorata* inclusion in fish diet at 1.0% concentration is therefore beneficial for use in aquaculture to enhance the growth of *C. gariepinus*.

Keywords: *Clarias gariepinus*, *Chromolaena odorata*, Growth parameters

Evaluation of Haematological and Serum Biochemical Characteristics of Broiler Finisher Birds fed *Artocarpus heterophyllus* (Jack Fruit) Leaf Extract (JFLE)

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Background: Beneficial use of synthetic antibiotics in livestock industry to maximise production efficiency, quality of product, control diseases etc cannot be overemphasized. Its ban as growth promoters by European Union, due to its cause of not only cross-resistance, but also due to the risk of possible drug multiple resistances in human pathogenic bacteria has necessitated the need for alternative growth promoters. The phytobiotics used as growth promoters are biological additives like blends of herbs or plant extracts. The bioactive ingredients in them such as alkaloids, flavonoids, glycosides, mucilage, saponins, tannins etc are the plant extracts commonly employed as feed. Gradually, interest has shifted on the use of medicinal plants due to their ethno-veterinary properties. One of such medicinal plant is *Artocarpus heterophyllus*. Several studies have shown that it has useful compounds like flavonoids, sterols, prenylflavones etc which may have been responsible for various pharmacological properties. Haemato-biochemical assays are used for nutritional studies in animals. Therefore the experiment was carried out to evaluate the haematological and serum biochemical characteristics of broiler finisher fed *Artocarpus heterophyllus* (jack fruit) leaf extract.

Methodology: A 56 day experiment was conducted to determine the haematological and serum biochemical characteristics of finisher broilers fed jackfruit (*Artocarpus heterophyllus*) leaf extract (JFLE). A total of 150 day old AGRITED strain commercial broiler chicks were used for the study. They were assigned to eight experimental treatments. Two methods of extraction (hot and cold) were used, and each method had four treatments and three replicates. Each treatment had 18 birds and was replicated 3 times with 6 birds per replicate in a 2x4 factorial experiment in complete randomized design (CRD). T₁ was the control; their water had no test ingredient, while T₂, T₃ and T₄ were given the *Artocarpus heterophyllus* leaf extract at different concentrations (30, 60 and 90mls) per litre of water respectively. At the end of the trial, blood samples were collected from the birds through the wing vein and examined for haematological and serum biochemical parameters. Haematological parameters analysed include packed cell volume, haemoglobin, red blood cell, white blood cell, mean corpuscular volume mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration. Biochemical parameters analysed include, glucose, protein, albumin, globulin, urea, creatinine, alkaline phosphatase (ALP) and aspartate amino transferase (ALT).

Results: All the haematological parameters analysed showed non-significant differences ($P > 0.05$) both in the extraction methods, treatment effects and interaction effects. In the serum biochemical parameters, only glucose, urea and creatinine differed ($P < 0.05$) significantly in the extraction methods, levels of treatments and interaction effects, while other parameters such as glucose, AST, ALT, ALP, protein, albumin and globulin showed non-significant ($P > 0.05$)

differences. Results obtained showed that haematological and serum biochemical parameters of birds were within the normal physiological range.

Conclusion The JFLE extract could be adopted as natural antibiotics in the broiler production without adverse effect on blood profile.

Keywords: Jack fruit leaf extract, broiler chicken, blood profile

Evaluation of Hydroquinone in Skin-lightening Cosmetics Marketed in Nigeria: A Public Health Concern

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Background: The use of skin-lightening cosmetics containing hydroquinone has been on the increase among women, young girls and some men despite its harmful effects on the body. Hence, the need to periodically monitor hydroquinone levels in skin-lightening cosmetics in beauty and cosmetics market.

Methodology: Eleven skin-lightening cosmetics were randomly purchased from different cosmetics outlets across three local government areas within Ilorin metropolis. Descriptive characteristics of each cosmetic were noted and qualitative analysis for the presence of hydroquinone was carried out using Thin Layer Chromatographic (TLC) technique. The amount of hydroquinone in the samples was quantified using a validated UV-spectrophotometry method at λ_{\max} 290nm.

Results: Six of the samples were manufactured in Cote d' Ivoire and three from the Republic of Togo. The other two products had no information about the manufacturing country. Only six out of the eleven samples were registered by National Agency for Food and Drug Administration and Control, and three of the samples indicated the presence of 2% hydroquinone on their product labels. UV-spectrophotometry method validation showed excellent linearity ($r^2=0.9993$), with limit of detection (0.7524 $\mu\text{g/mL}$), limit of quantification (2.2801 $\mu\text{g/mL}$), RSD (0.01 – 0.35%) and recovery (95.85 - 103.56%) in the concentration range of 5 - 50 $\mu\text{g/mL}$. Ten of the eleven cosmetic samples contained hydroquinone. The amount of hydroquinone in the samples ranged from 1.9 to 3.3%^{w/w}. Only three of the analyzed samples contained hydroquinone within the permissible limit of 2.0%^{w/w} in cosmetic products, while others were above the limit.

Conclusion: Nigeria cosmetic market is highly proliferated with skin-lightening cosmetics containing hydroquinone above the permissible limit for cosmetic products. Regulatory bodies should take proactive measures to combat this menace and safeguard the health of Nigerian citizens.

Keywords: Skin-lightening cosmetics, hydroquinone, permissible limit

Evaluation of Soil Quality Indicators for Development of Soil Heavy Metal Management Techniques; A Case Study of Minergy Coal Mine, Botswana

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Coal is one of the biggest contributors to climate change but Botswana is one of the countries that depend on coal for generating heat energy especially electricity due to its high combustion propensity and abundance. As a result, intensive exploration for more coal deposits, extraction through mechanized mining, and processing of extracted coal will certainly result in scarring of land, deforestation, air pollution and heavy metal pollution. Previous studies indicate that heavy metals (HMs) are the main source of pollution resulting from mining and processing of coal and if present may alter and/or impact the ecosystem adversely. Therefore, it is imperative to formulate soil management systems that impede the toxic effects of HM pollution or even better immobilize these pollutants. Against this background, this study sought to develop relevant soil management techniques for possible HM sequestration premised on the ideals of Land Degradation Neutrality Framework (LDN). This study assessed soil quality indicators as these are currently considered pristine before the onset of mining operations. These include soil organic matter, pH, soil texture and electrical conductivity (EC).

This study was conducted at an active coal mine, Minergy Coal Mine in Kweneng District in Botswana which started operating in 2018. The soil and vegetation (grass leaves) were drawn from 4 stockpile points in 4 cardinal points direction. Laboratory analysis which includes the Walkley and Black method, multimeter test, Malvern Multisizer was carried out. HM analysis was categorized by the Mehlich 3 extraction method. The soils are slightly acidic to neutral and are generally sandy soils with low organic matter content. Five (5) pollutants' by order of contamination Al > Fe > Mn > Zn > Cu were studied and Aluminum had the highest concentration of 82.18 ppm and the least pollutant was Copper with concentrations below 1 ppm and a few undetected. When measured against the standard threshold determined by World Health Organization-WHO and the pollution indices (CF& PLI) which are conventional approaches towards a complete categorization of HM load in environmental compartments, the pollution levels were low except for aluminum. In order to ensure environmental sustainability, techniques like but not limited to the use of chelation, fly ash, biochar, soil washing and bioremediation were interrogated. The overall results pointed to bioremediation where phytoremediation was the selected method. In the end other soil and environmental quality management procedures as well as monitoring were recommended.

Keywords: Coal mining, soil quality, sustainable development

Exploring and Redesign of African games for the Delivery of Health Education for the Control of Schistosomiasis

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Background: Schistosomiasis is a neglected tropical disease with a global prevalence of about 207 million infected Individuals (Steinmann *et al*, 2006). School-aged children between the age of 5 and 14 years are the most at-risk group. Therefore, they are the subject of the target for mass drug administration with praziquantel in schools and communities (WHO, 2006). Some studies have reported a high cure rate of praziquantel following repeated standard dose of praziquantel (Kabuyaya *et al*, 2017; King *et al*, 2011) treatment but there are still cases of reinfection few months after treatment (Kabuyaya *et al*, 2017; N'goran *et al*, 2001). Therefore, to compliment mass drug administration with praziquantel, the WHO (2020) road map 2030 stated that new interventions such as the use of health education need to be developed to serve as alternatives to the administration of praziquantel and the control of snails. However, health education as currently delivered for schistosomiasis control programs is static, and non-interactive methods such as posters, radio jingles and billboards are being used. This research, therefore, explored, identified and redesigned favorite traditional adult and children's games as health educational tools for the control and prevention of schistosomiasis.

Methodology: The study area was Ijebu-east local government area (LGA) of Ogun State. One hundred and twenty-nine adults (129) and sixty-two (62) children were recruited for the study. The study involved the use of community participatory approach using structured questionnaires to identify the African games played by adults and children. Data collected was analyzed using SPSS 23.0. The most preferred games played by both adults and children was documented and redesigned into health educational games by members of the community through focus group discussions made up of a heterogenous mixture of males and females. The games were designed by a graphics artist and presented to the community members for their inputs and amendments.

Results: The most preferred games among adults and children were the Ludo game (37.2%), followed by Ayo olopon (11.5%) and draft (9.9%). The ludo game was redesigned to have health education messages about the risk factors, prevention and control of schistosomiasis. A player moves backwards in the direction of the arrow when a risk factor is encountered and moves forward in the direction of the arrow when a preventive measure is encountered. The draft game was designed such that players learn about schistosomiasis as they play using the rules of the commercially available draft game. Health education messages were designed and placed on the pathway of the players and in the holes of the Ayo olopon game following the rules of the commercially available Ayo olopon game.

Conclusion: This study has proven that community participatory approach can be employed in the design of health education interventions to improve their acceptability by community members. Randomized Control Trials are needed to further determine the effect of the redesigned games in the control of schistosomiasis.

Keywords: African games, health education, schistosomiasis

Fatty Acid Profile of Freshwater and Marine Fishes in Zaria, Kaduna State, Nigeria

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Background: The demand for high quality fish oil has necessitated the determination of nutritionally healthy fatty acid component present in both marine and fresh water species which are needful component for proper healthy diets.

Methodology: Two freshwater species (*Citbarinus citbaris* and *Mormyrus rume*) and two marine (*Scomber scombus* and *Alaska pollock*) species were sampled in this study. Soxhlet extraction method was used to extract the fish oil using n-hexane as solvent according to AOAC standard. Gas chromatography coupled with mass spectrometry (GCMS) was used to determine the fatty acids composition of the fish oil. Identification of the fatty acids was carried out by comparing their peak retention time and molecular mass with the mass spectra obtain from the GCMS machine.

Results: A total of nineteen fatty acids were identified in the two freshwater species (*Citbarinus citbaris* and *Mormyrus rume*) while twenty-one fatty acids were identified in the Marine (*Scomber scombus* and *Alaska pollock*) species. Palmetic acid was the dominant saturated fatty acid found in all the species, while oleic acid was the dominant Mono-unsaturated Fatty Acid (MUFA) in the four species and Dihomo-gamma linolenic fatty acid was the dominant Poly-unsaturated Fatty Acid (PUFA) in all species.

Conclusion: The study revealed the presence of beneficial fatty acids in both freshwater and marine species of fish though the marine species are a more richer source of healthy fatty acid components.

Keywords: Fatty Acid, Marine Freshwater

GC-MS Analysis, Antiulcer and *in vitro* Antioxidant Activities of *Ficus platyphylla* Aqueous Stem Bark Extract

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Background: *Ficus platyphylla* Del. Holl (Moraceae) is a deciduous plant locally known as “gamji” among the Hausas. Its common name is broad leaf fig. The plant is used in traditional medicine for treating several diseases including stomach ulcers, pain, infertility, psychosis and depression. The aim of the study was to evaluate the antiulcer activity of *Ficus platyphylla* and to determine its phytochemical constituents.

Methodology: The antiulcer activity of the aqueous stem bark extract of *Ficus platyphylla* was evaluated in ethanol and indomethacin-induced ulcer models in male Wistar rats. For each of the models, the rats were randomly allotted into five groups (n=5). Group I represented the negative control group and received 5 mL/kg of distilled water. Group II was the standard drug group and received Omeprazole (20 mg/kg). Groups III-V were the extract treated groups and received 125, 250 and 500 mg/kg, p.o. respectively. The animals in the groups were pre-treated with either distilled water, omeprazole or the extract before induction of oral gastric lesions. In ethanol-induced model, an hour after the treatment, oral gastric lesions were induced with absolute ethanol at a dose of 8 mL/kg. After 2 h, rats were sacrificed by cervical dislocation and their stomachs excised and opened along the greater curvature for measurement of ulcer indices. In the indomethacin-induced model, an hour after treatment, oral gastric lesions were induced with the administration of 100 mg/kg of indomethacin. Four hours later, the animals were sacrificed as in the previous model. The ulcerated surfaces in each stomach were measured and the mean ulcer index calculated. The stomachs were fixed in Bouin's solution for histopathological analysis. The antioxidant activity of the extract was evaluated using total phenolic content (TPC), 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferric reducing antioxidant power assay (FRAP) methods. The extract was subjected to GC-MS analysis to identify the compounds present.

Results: In the ulcer models, the extract dose dependently and significantly ($p < 0.05$) inhibited the mean ulcer indices in the rats. At 500 mg/kg in both models, the extract caused more reduction in mean ulcer index than our standard drug. The result of the histology at 250 and 500 mg/kg showed gastric tissue with regular mucosa and Muscularis mucosa thus confirming antiulcer activity of the extract. TPC was 7.99 mg GAE/g. The IC_{50} of the extract and vitamin C were 0.17 mg/mL and 6.43×10^{-3} mg/mL respectively. In the FRAP determination, the reducing ability of the extract expressed as ascorbic acid equivalence was found to increase (0.21, 0.36, 0.61, 0.79 and 0.83 AAE/mL) as the concentration (0.2, 0.4, 0.6, 0.8, 1.0 mg/mL) increased. GC-MS analysis showed a total of 77 compounds of which 2,4-Di-tert-butylphenol (2.47%), Trifluoroacetic acid (3.03%), Cyclotetradecane (4.60%), 8-Pentadecanone (2.11%), 5-Octadecene (8.23%), n-Nonadecanol-1 (4.33%), 9-Octadecanone (5.97%), Hexadecanoic acid (2.41%), Benzenepropanoic acid (6.19%) were the ones whose area% were above 2.

Conclusion: The extract of *Ficus platyphylla* possesses potent antiulcer and antioxidant properties. They also contain various phytochemicals which may be responsible for these activities. Further studies are needed to isolate and test the activities of these compounds.

Keywords: *Ficus platyphylla*, GC-MS analysis, Antiulcer

Geographical Distribution and Diversity of *Microsporidia* spp in Tick Population in Ogun State

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Background: Microsporidia has been established as a potential biological agent for malaria elimination by vector control. Ticks are the second most important vectors and have also developed resistance to chemical control tools. Therefore, this study aims to map the distribution of microsporidia in tick populations in Ogun State as potential biological control agents for tick borne disease.

Methodology: Ticks samples were collected from cattle in abattoir. The tick samples were morphologically identified to species, sex and life stages. Each sample was homogenized and an aliquot was used to prepare a thin-smear on a microscope slide. The thin-smear air-dried, fixed using 70% methanol and stained using the Giemsa stain. The slides were examined under a compound microscope to detect microsporidia spores. The length and the width of microsporidia spores were measured using IC measure.

Results: Fifty cattle were surveyed in two abattoir (Isoro Aje Gbonagun; Lafenwa) and a total of five hundred tick samples were collected. The tick species identified were *Amblyomma variegatum*, *Rhipicephalus (Boophilus) decoloratus*, *Rhipicephalus (Boophilus) microplus*, *Rhipicephalus (Boophilus) annulatus*. Microsporidia was detected in 186 tick samples.

Conclusion: The tick populations in Ogun state are potential hosts of microsporidia endosymbionts and the diversity of the organisms needs to be investigated.

Keywords: Microsporidia, Tick, Geographical distribution

Growth Pattern and Morphometric Characteristics of Some Fish Species in Owalla Reservoir, South Western Nigeria

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Background: Owalla Reservoir is located on Osun River, about 12km from Okinni town and was created for provision of water supply to the community. The rate of urbanization and increasing population along the river catchment has increased waste generation and the water bodies are the recipients of such pollutants either directly or indirectly. Conversely, fish species and all forms of aquatic life are directly affected by these pollutants which inhibit dissolved oxygen via increased ammonia generation and mortality may occur. Paucity of documented information on the relationship between the water quality on fish survival necessitated this study. Based on this, the study was carried out to ascertain the status of fish species in terms of growth parameters. This is important because the resource consumption around the reservoir has greatly increased coupled with the various secondary use of water.

Methodology: The water quality parameters (temperature, dissolved oxygen, ammonia, pH, nitrite) were measured from both reservoirs from September 2019 to August 2020. Fish species were sampled using monofilament gill nets, identified using keys by Froese and Pauly (2019) and Olaosebikan and Raji (2013) and abundance recorded. The morphometric characters (total length, standard length, weight) of fish species were taken using a measuring board for the length (cm) and measuring scale for the weight (g). The length-weight relationship and condition factor was calculated.

Results: Fifteen species were identified with five most abundant were used for the study and their growth pattern exhibited a negative allometric growth ($b < 3$) although a positive relationship (r) was between length and weight which was significant ($P < 0.05$). most of the condition factor (K) was less than one. *Oreochromis niloticus* had $b = 1.57$, $r = 0.53$, $p = 0.00$, $k = 0.38$; *Chrysichthys nigrodigitatus* $b = 1.30$, $r = 0.59$, $p = 0.00$, $k = 0.61$; *Coptodon marie* $b = 1.86$, $r = 0.50$, $p = 0.00$, $k = 0.27$; *C. zilli* $b = 1.97$, $r = 0.97$, $p = 0.00$, $k = 0.35$ and *Mormyrus rume* $b = 0.47$, $r = 0.98$, $p = 0.00$, $k = 1.05$. The mean values recorded for temperature ($25.9 \pm 0.48^\circ\text{C}$), dissolved oxygen ($4.14 \pm 0.10\text{mg/L}$), pH (7.0 ± 0.01) and nitrate ($0.68 \pm 0.25\text{mg/L}$) were within the recommended range while ammonia ($0.13 \pm 0.20\text{mg/L}$), nitrite ($0.14 \pm 0.21\text{mg/L}$) were high and above the recommended limits.

Conclusion: It was observed from the study that Owalla reservoir is productive with great potential to support rich aquatic community but is affected by the water pollutants. Agricultural production and indiscriminate disposal of domestic wastes were noticed at some areas of the

reservoir. All these were the possible reasons for increased ammonia and nitrite concentrations and had possible effects on the condition of fish species in the reservoir which was low. To this end, strict compliance to environmental issues are utmost with monitoring by appropriate agencies for sustainability of aquatic resources.

Keywords: Fisheries Management, Owalla Reservoir, Water quality

Harnessing the Vast Opportunities in Green and Digital Research and Innovations in Sustainable Universities Development for National Transformation

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Background- Today, our world is in a cross-road economically, socially and environmentally. And the burning issues affecting the economies of the world especially Africa and in most developing nations, are the challenges of chronic and endemic poverty, hunger, climate change, injustices, restiveness and massive unemployment leading to increasing violent extremisms. Thus, to tackle these global challenges, our universities could develop new skills, capacities and talents in the areas of Digital, Green/Organic and renewable energy, inno-native designing for a resilient nation - Nigeria. Here, our universities could bridge the gap as Champions in Green and Digital technologies innovations for climate change, food security, poverty and extreme hunger eradication. We also, refer and propose best examples in this direction which is the HETAVED SKILLS GREEN AND DIGITAL TECHNOLOGY VILLAGE PROJECTS.

Thus, this paper contains key areas of green and organic areas for new research and skills development in our universities, new frontiers for Digital Entrepreneurship Development for Gender Empowerment, examples of Green and Digital projects for scaling, and suggestions for public and private partnership for universities sustainable development education with reference to our initiative endorsed by the UN SDSN- Sustainable Development Solutions Networks at <https://blogs.upm.es/education4sdg/2021/08/04/sustainable-development-and-green-and-digital-enterprises-innovations/>

Keywords: Green technology, Digital innovations, universities talents, new skills

Haematological Effect of *Moringa oleifera* Leaf and Seed Extracts on Local Male Turkeys

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Background: Blood acts as a pathological reflector of the status of exposed animals to toxicant and other conditions. As the examination of blood gives the opportunity to investigate the presence of several metabolites and other constituents in the body of animals and it plays a vital

role in the physiological, nutritional and pathological status of an organism. Hematology being part of the blood, its disorder is approached by identifying the primary haematopoietic component that affects the white blood cells, red blood cells and platelets or the coagulation system. Most of these abnormalities in haematology are quantitative in nature with either excessive or deficient production of one of hematopoietic constituents.

Methodology: A total of 36 male turkeys were used for the study, which was randomly assigned into four treatment groups. Replicated three times in each treatment group where the treatment groups were administered 0 gram of *Moringa* (T₁), 1 gram of *Moringa* seed alone (T₂) combination of 0.5g of *Moringa* seed and 0.5gram of *Moringa* leaf (T₃) lastly, 1 gram of *Moringa* leaf alone (T₄). Blood samples were collected at 36 weeks of age. Blood for hematological analysis was collected via wing vein using sterile needles and syringes, and were analyzed within 2 hours of collection. Blood samples for haematological analysis were discharged into ethylene diamine tetra-acetic acid (EDTA) containers. Three (3) milliliters of blood samples were drawn from three turkeys in each treatment. Hemoglobin (Hb) levels was determined using spectrophotometer (Environmental Scientific Instrument Co. Panchkula, Haryana, India) in a modified Drabkin's solution, (Diagnostic Reagent Ltd Thame, Oxon UK) which contains potassium cyanide. This was converted by the cyanide to a stable HCN, which was absorbed at 540 nm, using the cyanmethemoglobin method. The packed cell volume (PCV) was determined using microhematocrit (Jouan S. A. Cedex, France) method as described by Saleh *et al.*, 2010. The white blood cells (WBC) were estimated using the haemocytometer (Paul Marienfeld, Lauda-Konigshofen, Germany) as described by Saleh *et al.* (2010).

Results: The results showed that there were no significant differences in the red blood cell (RBC), Mean corpuscular volume (MCV), Mean Corpuscular hemoglobin (MCHC), hemoglobin (Hb). The white blood cell (WBC) and the packed cell volume (PCV) differed significantly among the treatment group. The *Moringa* extracts improved the PCV level of the turkeys. While the WBC levels were lower among the *Moringa* extract groups confirming that the turkeys were not under treat of any disease or immunity break down that will attract increasing WBC levels to combat the disease incidence.

Conclusion: It is therefore safe to conclude based on the study that *Moringa* improved the hematological quality of the local male turkeys.

Keywords: Turkey, hematology, extracts

Hepatoprotective Effects of some Herbal Plant Extracts using Random Amplified Polymerase DNA Analysis

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Background: Due to constant exposure of the genome to various chemical and physical agents in the environment, the DNA gets damaged resulting to lots of disorders in the body. In recent

years, plant studies have increased throughout the world. Immense evidences have shown that medicinal plants are therapeutic key factors in protecting DNA from consequences caused by chemical agents and oxidative stress due to their lesser side effects.

Methodology: Ethanolic leaf extracts of *Phyllanthus amarus*, *Moringa oleifera* and *Cymbopogon citratus* were investigated to determine their protective activities in repairing damaged DNA as a result of paracetamol induced hepatotoxicity in Wistar rats. Genetic variation and similarity among sixteen experimental rats were established using RAPD PCR analysis.

Results: Evidence of the effect of paracetamol-induced hepatotoxicity on the DNA of the rats and the protective effect of the medicinal plants were obtained from clusters and phylo-genetic analysis as revealed by primer OPT-08, OPB-12 and the pool data cluster. Treatment with herbal plants showed partial repair of the damaged DNA of the rats. However, *C. citratus* showed complete genetic repair of damaged DNA in one of the treated rats, while *P. amarus* and *M. oleifera* showed low activity at 250mg/kg compared to the effect of the standard drug used

Conclusion: This study revealed the hepatoprotective effects of three medicinal plants on damaged DNA as a result of paracetamol induced hepatotoxicity in Wistar rats using RAPD PCR analysis.

Keywords: DNA, Herbal plants, Hepatotoxicity

High Quality Cassava Flour: Microbiological Quality and Safety of Flours Produced from Selected Varieties of Low Postharvest Physiological Deterioration Cassava (*Manohot esculenta Crantz*)

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Background: The microbial properties of food are important quality characteristics of food materials as it relates directly with the health of the consumer. This study examined the microbiological quality and safety of high quality cassava flours produced from low postharvest physiological deterioration (PPD) cassava newly released by IITA.

Methodology: Wholesome four varieties of yellow-fleshed Low PPD cassava and one variety of high PPD cassava were, peeled, washed, grated, pressed, pulverized, flash dried at 120 °C for 8 minutes, milled with cyclone hammer mill fitted with a screen of 250 µm aperture size, cooled and packed into high density polyethylene bag. The high quality cassava flours produced were analyzed for total viable fungal and bacteria count, fungi isolated were further characterized and identified

using molecular methods. Data obtained were subjected to one way analysis of variance (ANOVA) using SPSS 25.0 and significant means were separated applying Duncan multiple range test.

Results: The mold count ranged from 1.50 ± 0.71 to 2.50 ± 0.71 cfu/ml, with flour produced from IITA-TMS-IBA-011371 and TMEB 419 having the lowest count while the highest was recorded in IITA-TMS-IBA-011368, respectively. The yeast count ranged from 1.00 ± 0.00 to 2.0 ± 0.00 cfu/ml, with flours produced from IITA-TMS-IBA-070593 and IITA-TMS-IBA-011371 having the lowest count while the highest was recorded in flour from IITA-TMS-IBA-011368, respectively.

Conclusion The total viable bacterial and fungal count (microbiological quality) of the flours prepared from IITA-TMS-IBA-011368, IITA-TMS-IBA-070593, IITA-TMS-IBA-011412, IITA-TMS-IBA-011371 and TMEB 419 cassava varieties were within the permissible limit of the microbial load of food allowed for human consumption according to the Standard Organization of Nigeria and CODEX.

Keywords: Low postharvest physiological deterioration, microbial load, permissible limit

Hours of Priming in Mature Coconut Water and Seed Weight Improved Juvenile Growth Phase in Soursop

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Background: Soursop (*Annona muricata*) is a fruit of the Annonaceae family. Soursop is eaten fresh or processed into juice, pulp and ice cream. Soursop is commonly propagated by seeds. Seeds of soursop contain thick black coat which hinders germination and emergence (Okoli et al., 2016). According to Baskin and Baskin (2001), seed coats impose dormancy because they may contain growth inhibitors or may prevent the leaching of inhibitors from the embryo and dormancy can be broken by seed priming (Khalid et al., 2019).

Methodology: The experiment was carried out in the nursery at the Teaching and Research Farm of Nnamdi Azikiwe University, Awka. Seeds were extracted from healthy ripe soursop fruits, washed under running tap water and air-dried under shade for 24 hours. Treatments consisted of two factors: hours of priming in mature coconut water (0, 12, 24, 36, 48, 60 and 72 hours) and seed weights {heavy weight (0.6 - 0.8 g) and light weight (0.3 - 0.5 g)}. The experiment was a 7×2 factorial laid out in completely randomized design with five replications. Fresh coconut water was obtained from fully matured coconut fruits in the Genetic Unit of the University. All seed weights were soaked, according to treatments before planting into polybags.

Results: The results of soursop dry matter content at 9 months after planting (MAP) is presented in Figure 1. Soursop dry matter content was significantly affected by hours of priming, seed weight

and interaction of hours of priming and seed weight ($P < 0.05$). Heavy seed weight primed at 60 hours produced highest dry matter (4.20 g) while light seed weight primed at 72 hours produced least dry matter (1.55 g). There was a significant positive correlation between dry matter content and leaf length, leaf width and root length ($p < 0.05$, Table 1). Consequently, an increase in dry matter content of soursop seedling could be associated with an increase in root length, leaf length and leaf width.

Conclusion: In the study, the roles of hours of priming in coconut water and seed weight as a pre sowing treatment and important agronomic factor respectively were highlighted. Results revealed that hours of priming in coconut water and seed weight can regulate seedling emergence and juvenile growth in soursop because coconut water contains growth hormone and heavy seed weight contains higher food reserve. Therefore, for vigorous juvenile growth phase of soursop, farmers should prime soursop seeds of 0.6 - 0.8 g at 60 hours in mature coconut water.

Keywords: Seed, Pre-sowing treatment, Soursop

Impact of Municipal Solid Waste on Physico-chemical Qualities of a Market Stream in Ilesa, Nigeria

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Freshwater is a natural resource essential for the survival of all ecosystems and life in general. The commonly found ones are rivers and streams which change in characteristics between their source and mouth due to discharge of industrial, municipal and agricultural wastes. These wastes of varying compositions alter the quality of water and pose health risk. Consequently, the effects of discharged solid wastes on physico-chemical properties of Ayo Stream, Irojo Market in Ilesa, were investigated.

Water was sampled from five points (A-E) spanning 600 m along the stream for five consecutive times over a period of five months. Such properties including colour, turbidity, conductivity, temperature, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Total Hardness (TH), magnesium, calcium, sulphate, lead, cadmium, iron, manganese, Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO) were determined using standard methods.

Results obtained showed highest value of conductivity (187.12 ± 15.32 mg/L), TDS (115.74 ± 7.61 mg/L), calcium (7.69 ± 1.24 mg/L), magnesium (3.48 ± 0.54 mg/L), manganese (0.021 ± 0.020 mg/L), pH (7.48 ± 0.41) and TH (33.50 ± 1.00 mg/L) at Sampling Point A, iron (1.04 ± 0.48 mg/L),

air temperature (29.28 ± 1.04 °C) and water temperature (28.20 ± 1.54 °C) at B, cadmium (0.015 ± 0.006 mg/L) and sulphate (294.17 ± 14.00 mg/L) at C, BOD (115.76 ± 111.07 mg/L) at D and colour (90.20 ± 3.22 mg/L), turbidity (87.00 ± 2.70 mg/L), lead (87.00 ± 2.70 mg/L), DO (6.58 ± 2.90 mg/L) and TSS (813.34 ± 47.26 mg/L) at E. Apart from TDS and TH at Sampling Point A, BOD at D and lead at E which were significantly different, there was no significant difference in the values of other properties at all points. Whereas mean lead and TDS were within the levels recommended by WHO and USEPA for water use, BOD, colour, turbidity and sulphate were above the maximum permissible levels by WHO, USEPA, European Union and Nigerian Standard for drinking water quality and mean BOD at Sampling Point D was comparable to values obtained in similar studies.

Conclusively, human activities around the Stream could have negatively impacted the quality of the stream and rendered it unfit for consumption.

Keywords: Physico-chemical; Ayo Stream; Solid waste

***In silico* Analysis of β -lactamase Inhibitory Potential and Evaluation of the Antibacterial Activity of *Pinus sylvestris* L. (Scots Pine) Essential Oils**

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Background: Antimicrobial resistance remains one of the global challenges that need urgent attention, including finding alternatives to conventional antibiotics. Essential oils (EOs) of *Pinus sylvestris* L. (Pinaceae) have been reported to possess diverse biological properties which include, antiseptic, antioxidant, antifungal, and anti-inflammatory.

Methodology: In this study, the EOs of *P. sylvestris* was extracted by hydro-distillation method, and twenty chemical constituents of the EOs identified by gas chromatography-mass spectrophotometry (GC-MS) were screened as potential inhibitors of β -lactamase, *in silico*, using molecular docking. The antibacterial activity of the EOs was then screened against thirteen

bacterial isolates, including *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas fluorescens*, *Bacillus* spp., *Micrococcus luteus*, *Proteus vulgaris*, and *Corynebacterium pyogenes*.

Results: The best antibacterial activity was observed against *K. pneumoniae* and *M. luteus* with an inhibition zone (Zi) of 24 mm, while the lowest activity was observed against *P. vulgaris* (Zi=8 mm). From the *in silico* analysis, benzene, 1,3-bis(3-phenoxyphenoxy) and ethanone, 1-(2,5-dihydroxyphenyl) showed good inhibitory potentials against AmpC and OXA-23 β -lactamases, respectively binding with the important catalytic serine residues (Ser64 and Ser79 for AmpC and OXA-23, respectively) with lower binding affinity energies (benzene, 1,3-bis(3-phenoxyphenoxy) = -10.1 Kcal/mol and ethanone, 1-(2,5-dihydroxyphenyl) = -7.5 Kcal/mol) compared to the FDA approved β -lactamase inhibitor, avibactam (-6.5 Kcal/mol and -6.6 Kcal/mol for AmpC and OXA23 β -lactamase, respectively).

Conclusion: The results obtained in this study showed that EOs of *P. sylvestris* has the potentials as a treatment option for bacterial infections including, ones caused by β -lactamase-producing bacterial pathogens.

Keywords: *Pinus sylvestris* L; antibacterial; beta-lactamase inhibition

Isolation and Characterisation of Lactic Acid Bacteria and Food-Borne Pathogens from Selected Fruits Sold in Major Markets in Ibadan, Nigeria

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Background: Lactic acid bacteria (LAB) exhibit strong antimicrobial activity against many microorganisms, including food spoilage organisms and pathogens.

Methodology: The organisms isolated from the healthy and spoilt fruits were subjected to microbiological analysis such as characterization and identification.

Results: The results showed that the most probable Lactobacillus species isolated from healthy fruits includes *L. casei*, and *L. brevis* with the highest percentages occurrence of 25% each while *L. desidosus*, *L. jenseni*, *L. plantarum*, *L. homohichii* had the lowest percentage occurrence of 12.50% each while the food borne pathogens isolated from spoilt fruits in this study ranged between 1×10^6 and 3.6×10^7 cfu/g. The possible pathogens isolated from spoilt apple, soursop and pineapple. This study includes *Aeromonas hydrophylia*, *Enterobacter aerogene*, *Klebsiella pneumoniae*, *Pseudomonas putida*, *Escherichia coli*, *Salmonella typhi*, *Shigella dysenteriae*, *Pseudomonas fluorescens*, *Bacillus coagulans*, *Bacillus licheniformis*, *Bacillus subtilis*, *Candida valida*, *Sacharomyces cerevisiae*, *Fusarium semitecum*, *Rhizopus stolonifer*.

Conclusion: Improper disposal of fruit contaminated with antibiotic-resistant bacteria could result to water pollution which can be a major threat to public health.

Lactic Acid Bacteria Supernatants as Postharvest Preservation of Tomato Fruits

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Background: Most consumers of tomatoes highly appreciate the vegetable in whatever form they are prepared in Nigeria because of the associated health benefits such as being good source of vitamins and minerals which help in improving digestion, stimulate blood circulation and reduce cholesterol among others. However, despite the reported multiple benefits, the postharvest availability of tomatoes is affected by a number of spoilage microorganisms among which, filamentous fungi are well-known to affect a wide range of varieties, leading to significant economic losses and food wastes. Furthermore, mycotoxins are allergens produced by many species of fungi posing a critical concern for the safety of the consumers.

Several metabolic products with antimicrobial activities against many microorganisms are being produced by Lactic acid bacteria (LAB). This food-grade product has been suggested to hold promising material for the control of many molds found on important fruits/vegetables such as tomatoes. This research aimed at using the cell-free supernatant of some Lactic Acid Bacteria for *in vivo* bio-control of tomato postharvest spoilage.

Methodology: In this research, 250 LAB were isolated from 25 samples of locally fermented dairy products in Kuje, Abuja, Nigeria between September and November, 2021. Screening of the isolates was done and the cell-free supernatants of *Lactobacillus plantarum* (LB69) species was found to exert strong *in vitro* antagonism against *Botrytis cinerea* and *Aspergillus niger* commonly associated with tomato spoilage. The cell-free supernatants of these fungi were then used as an *in vivo* bio-control agent in a direct assay using fresh, healthy tomato fruits with sterile distilled water as control.

Results: The result showed a delayed growth of both *B. cinerea* and *A. niger* on artificially contaminated tomato fruits when compared with the control. Hence, a 53% and 42% protection respectively by the cell-free extract was observed.

Conclusion: The results strongly suggest the possible inclusion of microbial-based solution for the safe and innovative control of postharvest loss of tomatoes in Nigeria thereby contributing to the food security, Safety and Sustainability efforts in Nigeria.

Keywords: Post-harvest; Tomato and Bio-control

Machine Learning Approach to the Prediction of Percentage Succinylation and Reaction Efficiency of Succinate Anhydride Modified Cardaba Banana Starch

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Background: Starch in its native state has properties such as low shear stress, high retrogradation and syneresis as well as high rate of starch digestibility thereby, making the starch unsuitable for application as food or functional ingredient. This research therefore, investigates the prediction of percentage succinylation and reaction efficiency of succinate anhydride modified starch using machine learning algorithms.

Methodology: The experimental factor were succinate anhydride concentration, time and pH while the dataset used for the prediction was obtained from Box-Behnken design and two machine learning algorithms; artificial neural network and decision tree were used while their effects on the responses were determined.

Results: The result revealed that the ANN model has a maximum correlation coefficient (R) of 0.9960, 0.9999, 0.9962 and 0.993 for training, testing, validation and all dataset respectively. The decision tree on the other hand also shows a good predictability of the responses owing to high correlation coefficient (0.8742). Using the ANN model, optimum modification parameters obtained were succinate anhydride concentration of 3%, reaction time of 56.34 min and a pH of 8.9 while the response obtained at the optimum conditions were percentage succinylation of 0.013% and reaction efficiency of 61.30.

Conclusion: Finally, the ANN model has a better predictability of the responses when compared to response surface methodology and decision tree algorithm.

Keywords: Machine learning, Cardaba banana; Starch modification

Mechanical Behaviour of Composite Produced with Quarry Dust And Rice Husk Ash For Sustainable Building Applications

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Background: This study is aimed at developing a sustainable composite using quarry dust (QD) and rice husk ash (RHA). Different percentages of QD and RHA (5 %, 10 %, 15 %, 20 % and 25 % wt/wt) were used for the partial replacement of river sand and cement respectively to produce non-conventional composite samples and conventional composite samples were produced using cement and river sand. The produced composites were moulded into block samples and cured at different curing ages (7, 14, 21, 28 and 56 days). Compressive strength results of the block samples were obtained using a Universal testing machine. The optimum percentage for the partial replacement of river sand and cement with QD and RHA respectively was found to be 5 % with compressive strength of 4.49 MPa at 28 days curing age. Compressive strength of the samples increased with an increase in the curing age. Over the years, the cost and environmental issues associated with the utilization of conventional building materials such as cement and river sand for housing projects kept increasing with the increase in the human population. The use of conventional building materials has not been able to solve the housing deficit challenge, rather, it has contributed to climate change due to the release of greenhouse gases into the atmosphere during the production of cement. This has led researchers to explore alternative building materials that are affordable and sustainable.

Methodology: Conventional and non-conventional composite samples were produced. Different percentages of quarry dust and rice husk ash (5 %, 10 %, 15 %, 20 % and 25 % wt/wt) were used for the partial replacement of river sand and cement respectively to produce non-conventional composite samples while conventional composite samples were produced using cement and river sand. The produced composites were moulded into block samples and cured at different curing ages (7, 14, 21, 28 and 56 days). The samples for each batch were produced in triplicate so that the average of the results would be presented to ensure better accuracy of data. Preliminary analyses such as X-ray Fluorescence (XRF) and Fourier Transform Infrared (FTIR) spectrometer were carried out on RHA and QD in order to understand their material properties and behaviours. XRF was used to identify the chemical composition of the materials whereas FTIR was used to identify the functional groups present in the materials.

Results: Optimum compressive strength of 4.49 MPa at a replacement level of 5 % was obtained for non-conventional composite samples. An increase in the curing age of both conventional and non-conventional composite samples increases the compressive strength. The bulk density of the composite samples increases with an increase in curing age. Generally, the compressive strength of the composite samples increases with an increase in bulk density. The cellular structures of RHA indicate the presence of micro-pores which makes it behave like a hydrophilic material.

Conclusion: The study indicates that QD and RHA could be used for partial replacement of river sand and cement respectively in developing sustainable building materials.

Keywords: Sustainable buildings; Environmental pollution, composite

Microbial Assessment of Bread Sold within Gusau Metropolis of Zamfara State

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Background: Bread is a common food commodity consumed all over the world. In Nigeria, hawkers sell it in the streets, motor parks, on roadside e.t.c. Bread is made from bread dough, which prepared by mixing flour with water, salt sugar, margarine and yeast in appropriate proportions. The dough was proven for one hour at 380c, baked for 30 minutes at -50c and then allowed to cool. There are various types of oven used for bread baking. However, Bread is a fermented confectionary product produced mainly from wheat flour, water, yeast and salt by a series of processes involving mixing, kneading, proofing, shaping and baking. Due to high cost of wheat which increases the cost of bread, composite flour are recommended for bread production. Normally, the surface of a freshly baked loaf for bread should be practically free of viable micro-organisms but is subject to contamination by mould spores and bacteria from the air during cooling and before wrapping (Ihekoronye and Ngoddy, 2017). Improperly sanitized equipment may also be a source of contamination. James (2013) reported that in bread, *Aspergillus spp* and *Penicilium spp* occur more frequently in mouldy bread than fungi.

Methodology: One gram (1g) of each of the bread sample were weighed and blended using a sterile blender and homogenized in 9ml of sterilized peptone water to give an initial dilution of 10^{-1} serial dilutions of the sample were prepared by transferring aseptically 1ml of the 10^{-1} dilution through 9ml of distilled water. This was continued until 10^{-1} , 10^{-2} , 10^{-3} , 10^{-4} , 10^{-5} and 10^{-6} of the dilution was attained Aboloma (2017).

Bacteria were isolated from the bread samples using the streak plate method, where an inoculum was taken from the homogenate and streaked onto the surface of the medium and then incubated at 39°C for 24hours Aboloma (2017) Enumeration of total aerobic micro-organisms, enumeration of coliforms and identification of bacteria isolated were done.

Also isolation of moulds and yeast, and enumeration and identification of Moulds and Yeast were also done. The Biochemical test carried out include Gram staining procedures, catalase test, coagulase test, indole test, motility test, citrate test, methyl red test and proskaner test.

Results: The highest bacteria counts was found in sample “L” of the fresh brand of bread as 4.3×10^6 as cfu/g, the lowest bacterial count was in sample “B” of the fresh board of bread 2×10^5 cfu/g. The highest bacterial count was in sample “L” of the sold brand of bread as 5.0×10^6 cfu/g and the least bacterial count was in sample “B” of the sold brand of bread as

2×10^5 cfu/g. While highest coliform count was in sample “M” of the fresh brand of bread as 2×10^6 cfu/g, lowest coliform count was in sample “D” and “E” of the fresh brand of bread as 2×10^4 and 2×10^4 cfu/g respectively. The highest coliform count of the sold brand of bread was in sample “O” as 5.0×10^5 cfu/g, lowest coliform count was in sample “E” of the sold brand of bread as 2×10^4 cfu/g.

Conclusion: The difference in microbial composition observed between samples may be attributed to differences in the sources of contamination of bread samples. This study showed the dominance of staphylococcus species and Aspergillus species association which are often encountered in the production of bread.

Bread and other baked products can become contaminated with spoilage bacteria, mould and coliform originating from contamination of raw material or the bakery environment. The presence of these organisms conform the lack of hygienic practice such as hand washing and other personal hygiene.

Therefore, there is need for extra care in bread processing and retailers handling and distribution methods.

Keywords: Microbial Assessment, Bread Sold, Gusau Metropolis

Microstructural Characterizations of Graphite Powder Processed from Recycled Batteries

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With the epileptic nature of electrical power supplies in a developing country like Nigeria, the dependence on dry cell batteries for varying domestic applications such as transistor radios, torchlights, remote controls, amongst others. In this study, over 1000 dry cell batteries were collected from different locations in Ede, Osun State and sorted. The batteries were sectioned to harvest the carbon rods which are key components of the battery cell. The rods were pulverized for about 15 hours and screened into different particle sizes using standard sieves. Five different graphite powder sizes obtained include $75\mu\text{m}$, $53\mu\text{m}$, $45\mu\text{m}$, $38\mu\text{m}$ and less than $38\mu\text{m}$. The microstructural characterization was investigated using Scanning Electron Microscopy (SEM), Energy Disperser Spectroscopy (EDS), X-ray Diffractometer (XRD), and Ultraviolet (UV)

Spectroscopy. The results of these investigations are presented in this present. Owing to the result obtained from the UV spectroscopy, the result is in good agreement with those available in literature.

Keywords: Graphite powder, SEM, XRD, UV, recycled scraps, reflectance, dry cell batteries, Microstructure

Novel Prospective Bioactive Compounds from *Vernonia amygdalina* for Sustainable Management of Type-2 Diabetes

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Background: *Vernonia amygdalina* of the family Asteraceae, a multi-medicinal tropical shrub or tree plant which is well renowned for its nutritional and health-promoting ability, particularly in the management of diabetes was investigated.

Methodology: The hexane, ethyl acetate methanol and aqueous extracts from each part (leave, root and stem bark) were subjected to gradient solvent elution in gravity silica gel column chromatography and bioactives obtained were further purified on preparative thin layer chromatography.

Results: Eight compounds which include five steroidal saponins; **vernioniamyoside B**, **vernioniamyoside D**, **vernionioside A4**, **vernoamyoside C**, **vernoamyoside D**, and two flavonoid glycosides; **luteolin-7-o-glucuronide** and **luteolin-7-o-glucoside** and a new compound; **glucoronolactone glycoside** were characterised using infrared, ¹H, and ¹³C nuclear magnetic resonance spectroscopies. The *in vitro* anti-diabetic potential of the extracts and isolated compounds were examined using alpha-amylase inhibitory assay, alpha-glucosidase inhibitory assay and albumin inhibitory assay and using acarbose as a standard drug. All compounds have significant activities with the methanol extract of the stem bark exhibiting higher alpha-amylase inhibitory activity (IC₅₀ 236.9 ± 0.8 µg/mL) than the standard, acarbose (IC₅₀ 478.1 ± 5.8 µg/mL).

Vernonia amygdalina has been shown to possess significant alpha-amylase inhibitory assay, alpha-glucosidase inhibitory potential.

Conclusion: The biological activities displayed by the extracts and isolated compounds from this plant add credence to the folkloric uses of the plant in the sustainable management of type 2 diabetes mellitus.

Keywords: Vernonioside; vernoniamyoside; NMR Spectroscopy

Phylogenetical Identification of *Trichoderma* Species: A Promising Biocontrol Agent of Yam Tuber Rot in the South-East Geopolitical Zone of Nigeria

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Background: Edible varieties of yam (*Dioscorea* spp) are the most important food crops in West Africa, East Africa, the Caribbean, South America, India and South East Asia. Rot causing fungi affect yam tuber, causing rot leading to reduction in quantity and quality. The study was aimed at identifying *Trichoderma* species through phylogenic method from yam tuber and evaluating their biocontrol potential.

Methodology: A total of thirty samples, of both healthy and unhealthy yam tuber were collected from farms in Osisioma Ngwa Local Government Area of Abia State, Nigeria and transported to the laboratory aseptically for microbial analysis. The samples were cultured according to the standard microbiological procedures, dual culture essay and molecular identification method.

Results: The fungi, *Fusarium*, *Aspergillus niger* and *Penicillium* sp were isolated from the spoilt yam tuber samples and *Trichoderma* species were isolated from the good tuber samples. The *Trichoderma* strains, *Trichoderma asperellum* (JN004180.1) and *Trichoderma koningiopsis* (MF5087061) were found. The identified species of *Trichoderma* were used for biocontrol study and varying antagonistic response were determined using dual culture essay method. The inhibitory effect of the biological antagonist *T. asperelleum* showed that it reduced the growth of *A. niger* by 78.6%, *Penicillium* sp by 51.2% and *Fusarium* sp by 69.2% while the antagonist fungus, *T. koningiopsis* reduced the growth of *A. niger* by 76.6%, *Penicillium* 46.1% and *Fusarium* by 61.5%. This study revealed the potential of biocontrol potential of the identified strains of *Trichoderma*, *Trichoderma asperellum* (JN004180.1) and *Trichoderma koningiopsis* (MF5087061) against common pathogenic fungi which cause spoilage spoil of yam in South-Eastern Nigeria and other regions of the world.

Keywords: *Trichoderma* sp. yam, biocontrol

**Physiochemical and Phytochemical Analysis of Bee Pollen (*Melliponula ferruginae*)
Obtained from Different Locations around UNILORIN Campus**

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Background: Bee pollen (BP) constitutes one of nature's most complete and nutritious foods because it gathers almost all nutrients necessary for humans. However, the composition of BP depends strongly on the plant source and geographic origin, together with other factors such as climatic conditions, soil type, and beekeeper activities.

Methodology: The different samples of bee pollen (*Melliponula ferruginae*) were collected from five locations around the University of Ilorin (Unilorin) campus (Bolunduro1, Bolounduro2, Bolounduro3, Bolounduro4 and Oyun). This was extracted with ethanol, stored for further uses. Phytochemical Screening and Proximate Analyses were carried out on the extracts.

Results:

Phytochemical analysis - Results obtained indicate the presence of alkaloids and steroids, while cardiac glycoside was not detected in all the samples. In addition, glycosides were not detected in samples obtained from Bolounduro 1 and 4, while phenols and terpenoid were not found in Oyun 1, also, tannins is absent in Bolounduro3 and flavonoid in Bolounduro2.

Ash content - Ash amount showed a significant difference and ranged from 2.5 to 26.4%.

Mineral Contents - The dominant minerals in the digested bee pollen samples were potassium (11.32 mg/100g and 6.3 mg/100g) followed by calcium (6.64 mg/100g and 3.02 mg/100g), iron (3.9 mg/100g and 0.56 mg/100g) from Bolounduro2 and Bolounduro4 samples respectively. For magnesium (2.44 mg/100g and 0.7 mg/100g), sodium (2.21 mg/100g and 1.17 mg/100g) from Bolounduro4 and Bolounduro2 samples respectively.

Conclusion: It is concluded that the proximate composition determined for ash and minerals indicated that bee pollen can be used as supplement diets for humans since the results of nutritional analysis found are in line with the international ranges of food quality.

Keywords: phytochemical, physiochemical, *Melliponula ferruginae*

Phytochemical Analysis and *in vitro* Anti-Inflammatory and Antioxidant Potentials of Leaf Fractions of *Sida linifolia* L. (Malvaceae)

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Background: The goal of this *in vitro* investigation was to ascertain the anti-inflammatory and antioxidant activities of ethyl acetate fraction (EAF) and ethanol fractions (ENF) of *Sida linifolia* leaf.

Methodology: Membrane stability, platelet aggregation, phospholipase A₂ activity, protein denaturation, heat-induced membrane hemolysis, and protease inhibition were the *in vitro* anti-inflammatory parameters examined. The assayed antioxidant parameters were 1, 1-diphenyl-2-picrylhydrazyl radical (DPPH) and nitric oxide radical (NO) scavenging activities, ferric reducing antioxidant power (FRAP) and total antioxidant capacity (TAC). The anti-inflammatory test employed aspirin as standard drug, whereas the antioxidant test used butylated hydroxytoluene (BHT), ascorbic acid, and gallic acid. Standard procedures were used to ascertain all parameters.

Results: Flavonoids, tannins, saponins, phenolics, alkaloids, terpenoids, steroids, hydrogen cyanide, and glycoside were found in significant amounts in the fractions after phytochemical examination. Both EAF and ENF showed considerably high percentage suppression of inflammation akin to the reference drugs at varied concentrations (0.2, 0.4, 0.6, 0.8, and 1.0 mg/ml), and this percentage inhibition increased with concentrations. However, ENF was significantly ($p < 0.05$) more potent than EAF at all concentrations. The *in vitro* study also showed that, both fractions had significantly ($p < 0.05$) strong antioxidant potentials which increased with concentrations. ENF had the highest overall antioxidant potential among the leaf fractions of the plant.

Conclusion These findings imply that *Sida linifolia* leaf has anti-inflammatory and antioxidant effects.

Keywords: Inflammation, Antioxidants, membrane stabilization

Phytochemical and Antibacterial Evaluations of *Alternanthera repens* (L.) and Honey Produced from *Apis mellifera* on *Pseudomonas aeruginosa* of Clinical Origin

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Background: Medicinal plants have long been utilized as a source of therapeutic agents worldwide. Recently, herbal medicines have increasingly been used to treat many diseases. *Alternanthera repens* has a great medicinal value due to its antibacterial potential. This study aimed at evaluating the antibacterial efficacy of the leaf and stem extracts of *Alternanthera repens* and honey against *Pseudomonas aeruginosa*.

Methodology: The extracts were screened for phytochemicals using the GC-MS analysis. The agar-well diffusion method was used for the in-vitro antibacterial bioassay of extracts. The susceptibility of *P. aeruginosa* to conventional antibiotics was also determined using Kirby-Bauer technique and which was compared with the antibacterial activities of the honeys, ethanolic leaf and stem extracts. The minimum inhibitory concentration and minimum bactericidal concentration of the honeys and extracts capable of inhibiting the growth of the isolate was determined.

Results: Phytochemical screening showed the presence and absence of total phenols, saponins, tannins, total flavonoids, alkaloids, cyanogenic glycosides, phytate and terpenoids in the plant extracts. The extracts and honeys were able to inhibit the growth of the *P. aeruginosa* at concentrations of 25 mg/ml, 50 mg/ml, 75 mg/ml and 100 mg/ml. The synergy of the honeys and extracts exerted higher antibacterial effect on the test organism.

Conclusion: It was concluded that *Alternanthera repens* and honey combined are promising antimicrobials for the treatment of infections caused by *P. aeruginosa*. Further research on the plant will uncover its therapeutic potentials for possible drug production.

Potential of *H. sabdariffa* Fractions on Angiotensin-Converting Enzyme and Phosphodiesterase V Activity on Sodium Fluoride-Induced Hypertensive Rat

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Background: Hypertension is a health-threatening disorder that has become rampant in most parts of the world today. However, reports have shown that exposure to sodium and fluoride ions via food consumption and toothpaste daily can aggravate this health challenge. Over time, the rural dwellers have been using *Hibiscus sabdariffa* to manage and prevent the occurrence of high blood pressure, this therefore shows that it could serve as a potent antihypertensive herb. This

study therefore, investigates the potential of *H. sabdariffa* fractions on angiotensin-converting enzyme and phosphodiesterase V on sodium fluoride-induced hypertensive rats.

Methodology: The bioactive constituents present in the leaves of *H. sabdariffa* were extracted using hydroethanol and were evaporated to dryness to obtain a slurry. The slurry was further extracted with different fractions using the separating funnel and each fraction collected was concentrated and kept until use. Forty rats (both sexes) were acclimatized in a well-ventilated condition with access to feed and water for a week. The rats (both sexes) were then grouped into five: Normal control (NC), NaF induced, NaF induced, and treated with *H. sabdariffa* Aqueous fractions (NaF+AQF-HS), n-Hexane fraction (NaF+HEE-HS), and butanol fraction (NaF+BTF-HS) and were treated with 100mg/kg bwt of each fraction daily for 14days. Before sacrifice, the systolic and diastolic blood pressure (SBP and DBP) of the rats were measured. Thereafter, the rats were sacrificed, serum collected and biochemical parameters were determined.

Results: The *in vitro* study carried out on the fractions using FTIR revealed the presence of some functional groups which are responsible for *H. sabdariffa* activity. The blood pressure measurement revealed that the NaF group had an increase in SBP and DBP while NaF+AQF-HS, NaF+HEE-HS, and NaF+BTF-HS had decreased SBP and DBP with the most potent fraction to be HEE-HS and HSBTF for the female and male rat respectively. After the rats were sacrificed, the activity of the angiotensin-converting enzyme (ACE), phosphodiesterase-5 (PDE-5), arginase in the serum was determined and it was observed to be elevated in all groups for both sexes when compared with NC while the reverse was observed in the NaF group. NaF+AQF-HS, NaF+HEE-HS, and NaF+BTF-HS show no significant difference in the level of Nitric oxide (NO), thiobarbituric acid (TBARS) as well as catalase (CAT), and superoxide dismutase (SOD) activity when compared with the control but revealed an increase in NO, CAT, and SOD when compared with NaF group with. Meanwhile, a decrease was observed in TBARS for both sexes when compared with the control.

Conclusion: It could be inferred from the results that the various fractions show hypotensive potentials with the most potent being NaF+BTF-HS. The activity of the BTF-HS could be linked to the ability of the bioactive constituents in the fraction to lower the SBP and DBP in both sexes.

Keywords: phosphodiesterase-5, angiotensin-converting-enzyme, hypertensive

Prevalence of ESKAPE Pathogens in Sheep

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Background: ESKAPE Pathogens (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter spp*) are the leading cause of

nosocomial infections throughout the world. It is an acronym comprising the scientific names of six highly virulent and antibiotic resistant bacteria pathogens.

Methodology: A survey was carried out to determine the prevalence of ESKAPE pathogen infection in Sheep at a District of Bokkos Local Government Area of Plateau. Blood samples were obtained aseptically from 70 sheep randomly selected. Samples were examined for ESKAPE pathogen infection using clinical laboratory methods including biological culture, Nucleic Acid Amplification, Ribosomal Protein Characterization, and Genome Sequencing. Pathogen identification from a single colony was by Matrix-assisted Laser Desorption/Mass Spectrometry (MALDI- TOF- MS). Analysis of high abundance proteins is gaining popularity in clinical laboratories. A library of glycolipid mass spectra from 50 microbial entries was developed that allowed bacteria speciation of the ESKAPE Pathogens.

Results and Conclusion: Data was analyzed and collected on the significance of $p < 0.05$. Out of 70 sheep examined, 10 positive cases were seen which stands at 1.4% prevalence. *Staphylococcus aureus* and *Enterococcus faecium* were the most prevalent pathogens observed; the others were not encountered in the survey. Male sheep had 3.8% infection rate while no prevalence was observed in the female counterpart. Younger sheep (< 2yrs) were more infected than older ones (>2 yrs) with a prevalence rate of 4.0% and 0.00% respectively. Sheep infected had slightly lowered mean peaked cell volume (28.0+ - 0.00) than non-infected sheep (29.23 + - 5.17).

Although there was no significant difference ($p < 0.05$) between their mean values, this survey has revealed that sheep though neglected during test and treatment against ESKAPE pathogens can be a source of reinfection as it was shown to harbour pathogens. Hence they should be included during test, treatment and observation of ESKAPE pathogens.

Recycling Waste Polycarbonate as a Bitumen Modifier in Hot Mix Asphalt

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Background: Disposal of polycarbonate waste has become a serious problem for human health, as these plastics are burnt for disposal, which in turn causes environmental pollution. Polycarbonates are not eco-friendly as they are non-biodegradable and are generally disposed by land filling or incineration. To deal with this problem, a study on the use of waste polycarbonate from compact disks as a modifier for bitumen, for use in hot mix asphalt (HMA) was considered in this research. Road surfacing with unmodified bitumen can cause bleeding in hot climate, may develop cracks in cold climate, possess fewer load bearing capacity and can cause serious damages because of higher axle load in present conditions due to rapid infrastructural development – Hence the need for modification.

Methodology: Thermogravimetric Analysis (TGA) is carried out on the modifier (polycarbonate) to assess its compatibility with HMA preparation temperature threshold and thus suitable for use in the bituminous mix. Marshall mix method was employed in the comparative analysis between the basic properties of the pure and modified HMA samples for 5%, 5.5%, 6%, 6.5% and 7% bitumen contents at 0%, 2%, 4%, 6%, 8% and 10% modifier contents. Further, comparative analysis was carried out between the pure and modified HMA mixes using Scanning Electron Microscopy (SEM) and two-way Analysis of Variance (ANOVA). Finally, regression analysis was carried out to establish relationships/predictive models among the trial bitumen contents, modifier contents and the HMA properties.

Results: The TGA results revealed that the modifier is suitable for use in HMA. Marshall test on the samples revealed a general increase in the stability (85.50%), bulk unit-weight (2.18%) and voids filled with bitumen; VFB (3.90%) but a general decrease in the flow (24.60%), percentage air-voids (26.20%) and voids in the mineral aggregates; VMA (10.60%) with increasing polycarbonate contents. Also, the properties of the pure HMA, as well as that of the modified HMA at 2%, 4% and 6% modifier contents met with the prescribed specifications of Nigerian General Specification for Road and Bridges (2016) but 8% and 10% modifier contents failed with respect to the HMA void properties (P_a and VFB). The SEM analysis showed that the voids in the asphalt mixes tend to reduce with increasing polycarbonate content; the modifier played a key role in reducing the voids in the HMA. The ANOVA analysis also revealed that the modifier had significant effect on most of the HMA properties for the various bitumen contents (5%, 5.5%, 6.0%, 6.5%, and 7.0%) and at the various modifier contents (2%, 4%, 6%, 8% and 10%); but had insignificant effects on the flow property for 5%, 5.5%, 6% and 6.5% bitumen contents at 2%. The regression models developed yielded good R^2 values of 0.849, 0.966, 0.834, 0.877, 0.821 and 0.83 for stability, flow, unit-weight, percentage air-voids in the mix, VMA and VFB respectively.

Conclusion and Recommendation: Based on the mechanical and volumetric analysis conducted, an optimum modifier content of 5.57% by weight of the optimum bitumen content is recommended for use in preparing hot-mix asphalt for wearing course of a flexible pavement.

Keywords: Waste management; Pollution control; Hot mix asphalt

Screening for Antibiotic Producing *Streptomyces* species Isolated from Farmlands in Abakaliki Local Government Area, Ebonyi State

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Background: Increasing occurrence of antibiotic resistant bacteria has necessitated the demands to screen for new sources of antimicrobial agents. Attention on the use of *Streptomyces* species has been on the increase due to its production of many useful bioactive metabolites. The study was aimed at screening the antibiotic producing potentials of *Streptomyces* species isolated from

farmlands in some selected locations in Abakaliki, Ebonyi State, Nigeria. Soil samples were collected from 5 different farms and transported to the Applied Microbiology Laboratory of Ebonyi State University, Abakaliki for analysis.

Methodology: Isolation and characterization of *Streptomyces* was done by culture-dependent methods and isolated *Streptomyces* were tested for antimicrobial activity on selected resistant clinical isolates of *Klebsiella* species, *Pseudomonas aeruginosa*.

Results: The result revealed that a total of 24 *Streptomyces* species were isolated. The highest inhibition zone diameter was expressed against *Klebsiella* species and *Pseudomonas aeruginosa* with an inhibition zone diameter ranging from 12.0 – 31.0 mm and 12.0 – 30.00 mm respectively, followed by *Streptococcus* species, *Escherichia coli*, and *Proteus* species with an inhibition zone diameter ranging from 7.0 – 22.0, 10.0 – 20.0 and 8.0 – 17.0 mm respectively.

Conclusion: The *Streptomyces* species isolated showed no inhibitory activity against *Staphylococcus aureus*. The result further revealed that the isolates exhibited a higher antimicrobial activity compared to the conventional antibiotics used. There is a need to explore indigenous *Streptomyces* for their potential to produce effective antimicrobial agents from different sources in the country.

Keywords: Bioactive compounds, Antibiotics resistant bacteria, Inhibition zone diameter

Studies on the Effects of *C. citratus* on the Blood Sugar Level and Glucose Metabolizing Enzymes of Streptozotocin-induced Diabetic Albino Rats

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Background: The blood sugar and metabolic enzymes levels of STZ-induced diabetic Wistar rats were studied by the administration of extracts and some selected phytochemicals of *C. citratus* using the *in vivo* model for a period of 14 weeks.

Methodology: Forty male albino rats of weights between 170-200g were used for the study and divided into eight groups of five rats each. The rats of the non-diabetic positive control group received 1 ml distilled water daily. Seven other groups induced with diabetes using streptozotocin by a single dose administration of 65 mg/kg b.w; one of these diabetic rat groups was left untreated and used a negative control while six other groups were treated with *Cymbopogon citratus* extract daily at 400mg/kg b.w. The antidiabetic potentiality of aqueous and ethanol extracts, flavonoids, saponins and tannins of *C. citratus* were determined by measuring the blood sugar level at an interval of four (4) weeks (0, 4, 8, 12 and 14) using glucose oxidase assay and the metabolic enzymes by measuring the glucose 6-phosphatase, and fructose 1,6-bisphosphatase activities.

Results: Results of treatment showed a decreased blood sugar level of *C. citratus* treated diabetic rats when compared with the diabetic untreated rats. The results of the metabolic enzyme assays shows a significant ($p < 0.05$) different in the levels of glucose 6-phosphatase enzyme in diabetic untreated rats when compared with control and other diabetic treated groups while F1,6-bisphosphatase level in the diabetic untreated rats was higher and significantly ($p < 0.05$) different when compared with control and other diabetic treated groups.

Conclusion: It can thus, be concluded that *C. citratus* has both hypoglycaemic and antidiabetic potentials.

Keywords: Diabetes mellitus, *Cymbopogon citratus*, Blood sugar

Studies on the Use of Lactic Acid Bacteria for the Bio-Control of Food Spoilage Mycotoxigenic Filamentous Fungi

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Background: In Africa, huge quantities of food production is lost along the supply chain emanating from harvesting time, climatic conditions, pre-harvest and post-harvest practices, storage conditions, etc. Mycotoxigenic fungi have been identified as the main agent in this deterioration. The associated potential health risk of the conventional chemicals in use is a challenge because some of them are toxic to human and animals. The use Lactic Acid Bacteria (LAB) as a microbial-based control has increased because LAB have some inherent abilities to inhibit spoilage organisms due to their active metabolites which are 'Generally regarded As safe'. Therefore, the aim of this research was to select LAB strains from some locally fermented dairy products for in vitro test against some food spoilage fungi.

Methods: A total of 148 LAB strains were isolated from fermented dairy product (Nono) prepared by some house hold women in Lugbe, Abuja, Nigeria. After screening, *Lactobacillus plantarum* LB09 showed the strongest antifungal ability and was grown in MRS broth until the late exponential and stationary phase by incubation at 40°C for 48 hours to obtain cell-free supernatants which were obtained by centrifugation ($8000 \times g \times 5 \text{ min}$) and filtration (0.45 μm -pore-size filter). The antifungal activity of the obtained CFS was determined by radial growth inhibition of hyphae. In the process, modified PDA plates (supplemented with 0.5% Chloramphenicol to suppress the Bacterial Growth) were prepared and 10 μL of a freshly-prepared solution containing about 1×10^6 spores/mL of *Aspergillus sp.* and *Fusarium sp.* Were spread on the plate, a hole with a diameter of 6 mm was punched aseptically with a sterile cork borer tip, and an aliquote, 20 μL of the CFS solution was introduced into the holes respectively. The control plates were prepared by adding the same concentration of sterile MRS broth. The set-up was incubated for 72 hours after which the respective inhibition percentage was determined by measuring the radial growth of the hyphae. All the assays were performed in triplicate.

Result: The *in vitro* results show that the cell-free supernatants (CFS) LAB strain had antifungal activities against the test spoilage fungi having recorded the average inhibitory zones of 22mm and 28mm.

Conclusion: The frequent occurrence of these fungal species poses concern as most of them are known to be potent producers of toxic substance as such, this research was carried out to contribute to the knowledge that some lactic acid bacteria strains could be isolated from the wild and used as a control agent against some toxin-producing molds.

Keywords: Mycotoxin, Antifungal, Bacteriocin, supernatants

Survey of Community-Acquired Methicillin Resistant *Staphylococcus aureus* from Event and Viewing Centers in Kano Metropolis, Nigeria

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Background: Methicillin resistant *Staphylococcus aureus* (MRSA) is a threat to both the hospital and community. Community-acquired methicillin resistant *Staphylococcus aureus* (CAMRSA) is increasing rapidly leading to increase in morbidities and mortalities rate in the world.

Methodology: The aim of this work was to survey for CAMRSA from Event and Viewing Centers in Kano Metropolis, Nigeria. A total of 780 samples (192 and 588 from indoor air and human and fomite-surfaces respectively) were collected between November 2019 and March 2020 and processed using standard techniques.

Results: A total of 374 (63.6%) and 130 (67.7%) *S. aureus* and 51(13.6%) and 7(9.5%) MRSA were isolated from surfaces and indoor air respectively, (Indoor air isolate comprising 56 (58.3%) and 74 (73.1%) *S. aureus* which were obtained before and during the programs respectively). Results also revealed that 7(9.5%) MRSA from Event and Viewing Centers was obtained during programs. Results also revealed that 182 (57.8%) and 18 (9.9%) were *S. aureus* and MRSA from surfaces of Event Centers while 192 (70.3%) and 33 (17.2%) were *S. aureus* and MRSA from surfaces of Viewing Centers respectively. The highest number of 31(8.3%) and 36(9.6%) isolates were from Gwale event and Dala Viewing Centres respectively, while Nasarawa Event and Kumbutso Viewing Centers has the lowest number of 16(4.3%) and 8(2.1%) *S. aureus* isolates respectively. Results further revealed that Ungoggo event and Gwale Viewing Centres yielded the highest number of MRSA isolates of 5(9.8%) and 7(13.7%) respectively, while Tarauni and Fagge Event Centers both had 0(0%) MRSA. *S. aureus* had the highest susceptibility to Ciprofloxacin and gentamicin with 90.1% and 80.1% respectively from Event and Viewing Centers. Greatest level of resistance was observed with ceftriaxone and ceftazidime isolated from Event and Viewing Centers with 68.2% and 76.6% respectively. Furthermore, MRSA isolates were generally resistant to beta-lactam antibiotics with 4/7(57.1%) and 28/51(54.9%) from air and surfaces being

multidrug resistant, respectively. It was found that *mecA* gene was detected in 3/7 (42.8%) of the MRSA isolates and *pvl* was detected in 1/3 (33.3%) of them.

Conclusion: The study detected a high level of *S. aureus* and MRSA from Event and Viewing Centers. It is recommended that proper building design of Event and Viewing Centers should be done in order to aid ventilation and avoid overcrowding. Also, strict adherence to aseptic procedure and regular screening for the presence of MRSA should be observed in order to control colonization and infection.

Keywords: Methicillin Resistant *Staphylococcus aureus* (MRSA), Community, Resistant

Synthesis and Characterization of Carboxymethyl Cellulose from *Eichhornia crassipes* and *Pennisetum purpureum* as Potential Source of Sustainable Drilling Mud Additives

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Background: Cellulose extracted from *Eichhornia crassipes* (Water hyacinth) and *Pennisetum purpureum* (elephant grass) was used to synthesize carboxymethyl cellulose (CMC) under heterogeneous condition with ethanol as the supporting medium. Effect of concentration of sodium hydroxide (NaOH) on the modification of cellulose to yield CMC was investigated.

Methodology: Comparative studies of the two biomass samples through physico-chemical analyses in terms of degree of substitution (DS), water absorption capacity, water loss, pH, conductivity and analytical characterization using SEM-EDX, FT-IR and EDXRF spectroscopy of the extracted cellulose and synthesized CMC were done. The degree of substitution of carboxymethyl cellulose obtained by alkalization reaction of cellulose from *Eichhornia crassipes* and *Pennisetum purpureum* with monochloroacetic acid was in the range of 0.54-0.75 which showed that it is highly soluble.

Results: Fourier Transform-Infrared (FT-IR) spectrophotometer showed changes of functional group from cellulose to CMC. The absorption at 3283 cm^{-1} and 3320 cm^{-1} as observed in *Eichhornia crassipes* and *Pennisetum purpureum* spectra showed OH vibration of polymeric compounds. The presence of bands at 1592 cm^{-1} and 1417 cm^{-1} in *Eichhornia crassipes* spectrum and bands at 1566 cm^{-1} and 1410 cm^{-1} observed in *Pennisetum purpureum* spectrum showed the presence of $-\text{COO}$ group as a result of carboxymethylation reaction on cellulose during modification process. EDXRF was applied for quality control and product development due to the unavailability of the elemental composition of elephant grass and water hyacinth in the literature. The morphology and elemental compositions on the surface of the biomass were analyzed by SEM-EDX and among the chemical elements detected were C, O, Na, Mg, Al, S, Cl, K, Ca, Fe, Si and Zr which confirms the elements

identified with EDXRF spectroscopy. XRF spectra show high peaks at Fe, K and Sn for untreated *P. purpureum* samples and high peaks at Ca, Fe and Sr for untreated *Eichhornia crassipe* fiber.

Conclusion Both samples are rich in Iron (Fe). Samples were free from some toxic elements such as Pb, As, Hg, V and Ni which makes them safe for use as novel raw materials for industrial applications. Also very low concentration of Sulphur in the samples, make them safe to be considered as additives in drilling mud formulation.

Keywords: Carboxymethyl cellulose, Agro-wastes, Environmental friendly

Techno-economic Assessment of *Kunu-zaki* Drink Package in Tetrapak

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Background: Milk and its fermentation products, such as yogurts, had been the probiotic carriers of choice for various reasons, including milk's recognition as a healthy product. However, more recent research efforts into probiotic potentials of cereal-based beverages are yielding remarkable results. This research therefore, investigate the economic potential of packaging *kunu-zaki* drink in tetra pak.

Methodology: Economic evaluation of the production process system was based on the established processing conditions for probioticated *kunun-zaki* production. The production process for the *kunun-zaki* was based on a constant mass flow rate from an aseptic brick cartoon filling machine with a line production speed of 7500 packets per hour having a net volume of 1 litre per pack. Cost was based on this level for an industrial plant working one 8-hour shift for 330 days per annum. Sensitivity analysis was carried out by varying the numbers of production days (330,300 and 250 days) at 100% plant capacity and also by varying the plant utilization capacity (100, 85 and 70%) for the production processes.

Results: The results indicate that the total capital cost (TCC) and the annual production cost (APC) were $N6.26 \times 10^8$ and $N2.67 \times 10^9$ /year, respectively. The overall revenue after the tax was $N6.56 \times 10^8$ /year. The return on investment (ROI), single payback period (PBP), discounted payback period, gross margin and internal rate of return (IRR) of the plant were 64%, 1.56 years, 2.06 years, 23% and 76.02%, respectively. The result also showed that the *kunun-zaki* production plant is feasible and could be operated for 330, 300 and 250 days.

The difference lies on the profitability, which decreases as the number of operation days and plant utilization capacity reduces.

Conclusion: Based on the result of this analysis, the commercialization of probioticated kunun-zaki beverage is feasible with guaranteed profitability.

Keywords: Probiotic beverage; Techno-economic analysis; *Kunu-zaki*

Trend Analysis of Wind Speed and Relative Humidity over Nguru, A Floodplain of Hadejia-Nguru Wetlands

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This paper presents the trends of wind speed and relative humidity of Nguru, a town situated around Hadejia-Nguru Wetlands with the aim of revealing the pattern within 40 years. A non-parametric Mann-Kendall trend test and Sen's Slope Estimate was used to analyse trends exhibited by the variables. The result revealed an annual downward trend of wind speed at the rate of $-0.010 \text{ ms}^{-1}/\text{year}$. Across the months the wind speed revealed downward trend in the range of $-0.001 \text{ ms}^{-1}/\text{year}$ to $-0.030 \text{ ms}^{-1}/\text{year}$ with the exception of January and February where the analysis exhibited upward trend of $0.001 \text{ ms}^{-1}/\text{year}$. The relative humidity also revealed an annual downward trend at the rate of -0.001 \%/year . Across the months the relative humidity revealed downward trend in the range of -0.001 \%/year to -0.070 \%/year with the exception of July, August, and September where the analysis exhibited an upward trend at 0.001 \%/year , 0.100 \%/year , and 0.120 \%/year respectively. It is concluded that there are variability of wind speed and relative humidity at an annual rate of $-0.010 \text{ ms}^{-1}/\text{year}$ and -0.010 \%/year respectively. The study recommends for the consideration of these variability for any planning or decision making of management of water resources in the study area.

Keywords: Mann-Kendall Test, Relative Humidity, Sen's Slope Estimate, Wind Speed

Valorization of *Acalypha wilkesiana* Acid Extract as a Potential Green Inhibitor in Mitigation of Mild Steel Corrosion in Acidic Medium: Isotherms, kinetics and Thermodynamics Studies

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Background: The use of synthetic compounds as corrosion inhibitor is diminishing due to the strict environmental regulations and toxic effects of the compounds on human and animal life.

Consequently, there exists the need to develop a new class of eco-friendly corrosion inhibitors with low toxicity and good efficiency. Previous studies showed plant extracts as good inhibitors for metal corrosion studies. Therefore, this study investigated the inhibitory potential of *Acalypha wilkesiana* (AW) extract on mild steel in 1M HCl using gravimetric analysis.

Methodology: *Acalypha wilkesiana* leaves were obtained from teaching and research farm, Federal University of Technology Akure (FUTA), authenticated by Crop, Soil and Pest Management Department, FUTA. AW was dried in the oven at 80 °C for 2 h, after which, it was pulverized into fine powder using industrial grinding machine and sieved with 50 µm mesh. About 30 g of the powdered sample was weighed in a 500 mL beaker and 300 mL dilute 1M HCl was added. The mixture was transferred into water bath at 90 °C for 3 h for extraction. After the extraction, the mixture was cooled overnight and filtered. The filtrate was stored in 250 mL amber bottles at room temperature. From the stock solution obtained, inhibitor test concentrations of 1 – 5% (v/v) were prepared by diluting it with 1M HCl solution.

Experiments were performed by varying contact time, initial concentration of the inhibitor and temperature.

Results: Preliminary investigation of the phytochemical constituents showed that AW contains tannin, flavonoid, saponin, alkaloid, steroid, terpenoid and some other compounds in trace constituents. The results equally showed that the extract acted as a good corrosion inhibitor for mild steel in acidic medium. The inhibition efficiency increased with an increase in inhibitor concentration (1-5%) and temperature (303-333K) from 68.67-76.45 % and 76.78-83.98%, respectively.

Conclusion: The adsorption of the inhibitor on the mild steel surface in acid solution was better fit with Langmuir adsorption isotherm model. Kinetic study of the data followed pseudo-first order kinetic and the half-lives of the metal increase with increase in the concentration of the extract suggesting that inhibition efficiency increases with increase in the concentration of the extracts. These indicated that mechanism of the corrosion inhibition might be due to chemisorption. Calculated thermodynamic parameters revealed that the corrosion inhibition is endothermic and spontaneous in nature.

Keywords: Corrosion inhibition; Mild steel; Model

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